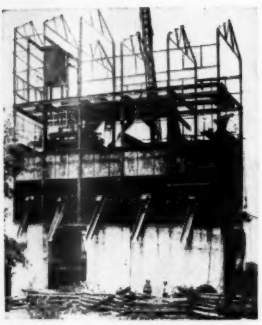
Pit and Quarry

Schaffer Crushing Plant



Many of our clients, to meet present conditions and local demands, are calling for designs of crushing plants of moderate capacity—portable in certain cases—yet embodying all labor-saving features. It is false economy to build such a plant unless all equipment and materials are of the best possible quality, and of the very latest design.

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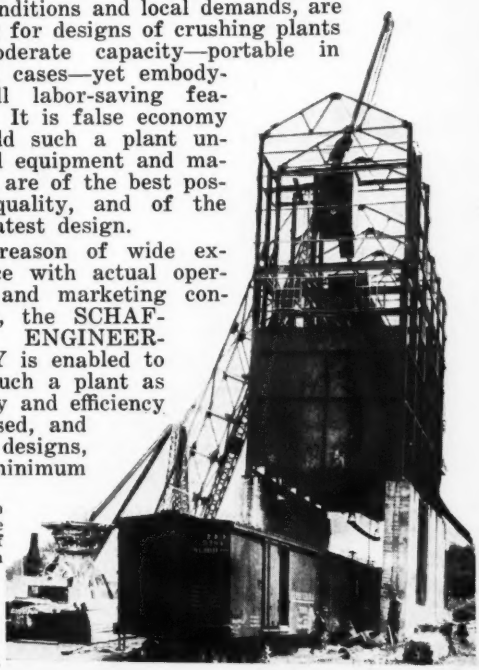
We solicit an opportunity to explain this service in detail, and at the same time place at your disposal a vast amount of research data accumulated by us through many years' experience.



SCHAFFER ENGINEERING & EQUIPMENT CO.
Peoples Bank Bldg.
Pittsburgh, Pa.

AUGUST, 1921

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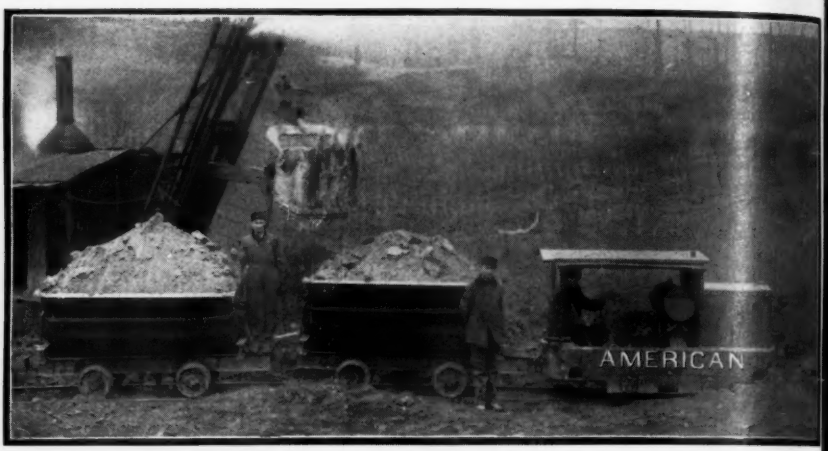

Photograph of the American Gas-O-Motive in a large Western Brick Yard.

Lets Get Down to Facts

The American Gas-O-Motive was designed and built for only one purpose —to perform honestly and faithfully, and a little better than any other gasoline locomotive on the market.

Each installation has brought additional proof of our claims, and the Gas-O-Motive has made for itself a permanent and enviable place in the industrial world.

It is operating efficiently, economically, and to the complete satisfaction of everyone who has given it a trial.

We are so confident of our ability to convince you of the superiority of the Gas-O-Motive, that we urge you to let us arrange a demonstration.

THE HADFIELD-PENFIELD STEEL CO
BUCYRUS, OHIO

Pit and Quarry

Member Audit Bureau of Circulations
A Monthly Journal for Producers of Sand, Gravel, Stone, Cement, Gypsum and Lime

VOL. 5 CHICAGO, ILL. AUGUST, 1921 NO. 11

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COMPLETE SERVICE PUB. CO.

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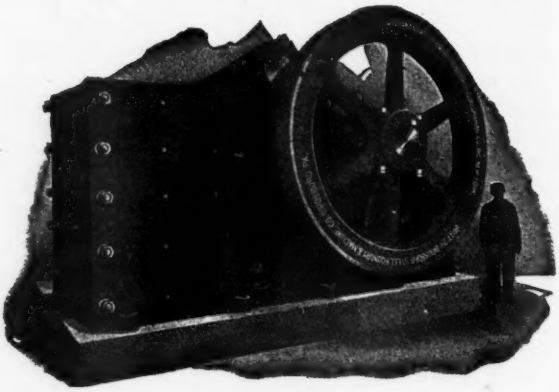
BUCHANAN CRUSHERS



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Bulletin No. 9—small crushers

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C. G. BUCHANAN CO., Inc.

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Pit and Quarry

Vol. 5 | Chicago, Ill., August, 1921 | No. 11

THE Associated General Contractors are placing before the state highway departments of the country a strong appeal for the placing of road contracts in the fall. It seems that this movement should have the hearty endorsement and co-operation of all aggregate producers. The advantage to all parties are very apparent:

1. Open-top cars are scarce in the fall, but plentiful in the spring and early summer.

2. Fall contracts enable the contractor to organize for the spring, to arrange for storage and unloading during the winter, thus permitting early movement of materials in the spring.

3. The contractor can purchase his equipment, get it delivered on the job and be ready for actual work as soon as the weather is settled in the spring. The number of employes and superintendents for the contractor is also reduced because of longer distribution of their work.

4. Aggregate producers need no statement of the advantages of fall contract letting. When the season is short, the cost of production is very much higher and the selling price lower. With a longer season many economies are possible, which result to the advantage of the roads and the road-using public.

5. Anything which increases the period of production decreases the cost and this is true not only of aggregate but of cement and equipment as well as transportation and all other kinds of service.

OHIO is paying out more than a million dollars a week for state highway construction. That's good!

JUST about the time this issue reaches you Pennsylvania will be opening bids for sixty miles of hard surface roads. That will keep a few plants busy.

THE supply of open-top cars is rapidly being taken up, and the demand will increase from now on for the remainder of the season. Better take such steps as are possible to insure a sufficient supply.

CEMENT mills which last year broke all production records have produced 42,000,000 barrels during the first six months of this year and have actually shipped 40,075,000 barrels. All of which means activity in the cement plants as well as in the production of aggregates to mix with this cement.

THIS is a good time to remember that it is not price reduction, but price stability which tends to inspire confidence. A New York observer points out that last year at this time the price tendency was upward, while now it is downward; but the effect has been the same—namely, to make the prospective builder uncertain and hesitant. Uncertainty and vascillation are about as disastrous elements in the building field as in military strategy. A price, once determined, should go through the season without variation. And not the least of the benefits would be to the "ultimate consumer" himself—for he would have something to show for his money, rather than waiting idly to see what might "turn up."

TEXAS is one of the enterprising states in the matter of road building. It has now under construction 192 state and Federal-aid projects, involving the building of 2,301 miles of highway, for which the total contract cost is $26,955,348. Of this amount $9,260,986 is Federal-aid money which has actually been granted. Of the 2,301 miles under construction 83.7 miles are being paved with concrete, 421 miles with bituminous types, 1,265 miles with gravel. Although the remaining mileage is surfaced with a cheaper class of material, all drainage structures will be permanent. There are seventeen projects, totaling 144 miles, not yet under contract, but upon which plans have been approved and which are estimated to cost in excess of $3,500,000. Of other work proposed, project statements have been approved for sixty-five projects, 653 miles long and estimated to cost approximately $10,000,000, for the construction of which $2,500,000 of Federal aid and more than $1,000,000 of state aid have already been allotted.

There are now a total of 414 projects under the supervision of the state highway department either being maintained, constructed or proposed, involving more than 4,000 miles, for which the total estimated expenditure is approximately $49,000,000.

ILLINOIS is to be congratulated on seeming to have entered upon a definite and regular program of contract lettings. Just at this writing the routine of state business at Springfield is jeopardized by "wars and rumors of wars," if the newspaper reports are to be believed ,but this is a crisis which will probably have passed before this issue gets out to its readers.

The legality of the project for a state-owned cement plant for South Dakota has been upheld by the courts.

A PROGRESS report has been sent out by the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, composed of affiliated committees of the American Society of Civil Engineers, American Society for Testing Materials, American Railway Engineering Association, American Concrete Institute, and Portland Cement Association. Recommendation for 15 per cent tolerance passing No. 4 sieve and 5 per cent passing No. 8 is made for all sizes of coarse aggregates. The general specification for coarse aggregate says: 'Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials with similar characteristics, or combinations thereof, having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter." The sizing specifications recommend maximum and intermediate sizes and the tolerance mentioned above. The intermediate size is left blank, to be filled in to comply with local conditions.

WE do not believe the people of the nation are in favor of retrenchment to the extent of cutting off national aid for the construction of good roads. There is no investment the Government can make which will bring such quick and satisfactory returns to the people. Let the money be saved in some direction where there is less certainty of immediate benefits.

THE exchange of credit information is one of the valuable lines of activity for a state or local association. More of this could be done to advantage.

ROAD building is not so expensive as some people seem to suppose. There are enough contractors looking for this class of work to supply the competition which will eliminate any undue profit. Here, for instance, is a little summary of some New York lettings, made by Engineering News-Record:

Bids opened by the New York State Commission of Highways on July 13 revealed the fact that the low bids on the eighteen construction and repair projects covering 68 miles of highways totaled $2,327,882, or approximately 86 per cent of the engineers' estimate on the work. There was not one project advertised upon which no bids were received and the total number of bidders was 111. Ninety-one contractors bid to build 60 miles of road of various types, one project of 8.8 miles attracting eighteen bidders. Another project of a length of 3.2 miles received twelve bids and another of five miles, ten bids. A repair project 3.66 miles long attracted eleven bids. Only three projects received two bids or under and two of these projects were repair jobs each, less than a mile long.

Not only were the low bids 14 per cent under the engineer's estimate, but the high bids totaled $2,603,717, or approximately 96 per cent of the engineer's estimate. On the project for which 18 contractors bid, the low bid was $50,000 under the engineer's estimate and there was a difference of less than $40,000 between the low and the high bidders.

AFTER much talk about a "cement trust," the Government has decided to find out actually whether there is such a thing. We hope the question will be settled finally when the investigation is completed.

A WORD of encouragement comes from Washington, stating that Government experts who deal with business say that various companies are notifying their employes to be ready to work full time after September first. Many companies which were a few months ago thought to be insolvent have been saved.

A CAREFUL reading of the business publications, a receptive attitude toward real selling ideas and the ability to adopt them and pass them on, will do more to bring business back to normal than any number of inspirational appeals or speeches.—Printers Ink.

AN announcement of more than ordinary interest is that given out by the Consumers Company, Chicago, to the effect that they have gained control of approximately 25 per cent of the sand, gravel and crushed stone business of Cook county. The properties and equipment of the Cook County Supply Company, with its ten subsidiary organizations valued at $5,000,000 have been absorbed.

One of the subsidiary organizations taken over is the Producers Material Company, which operates a boat line of three tugs and twelve barges.

In addition to those mentioned, the following companies were included in the merger: United States Crushed Stone Company, McCook, Ill.; Argo Stone Company, Argo, Ill.; Illinois Stone Company, Lemont, Ill.; Universal Stone Company (two plants), Racine, Wis.; Lake Shore Sand and Gravel Co., Algonquin, Ill.; Federal Sand and Gravel Co., Beloit, Wis.; Producers Material Company, the Agricultural Brownstone Co., and the Artesian Stone Co., all located on Campbell avenue, Chicago, and the United States Building Material Co., which has been the operating organization of the Cook County Supply Company enterprises, with offices at 29 S. La Salle street.

Plant of Fuller-Becker San

Fuller-Becker Sand and Gravel Co.

Plant at Oxford, Mich., One of Best in State

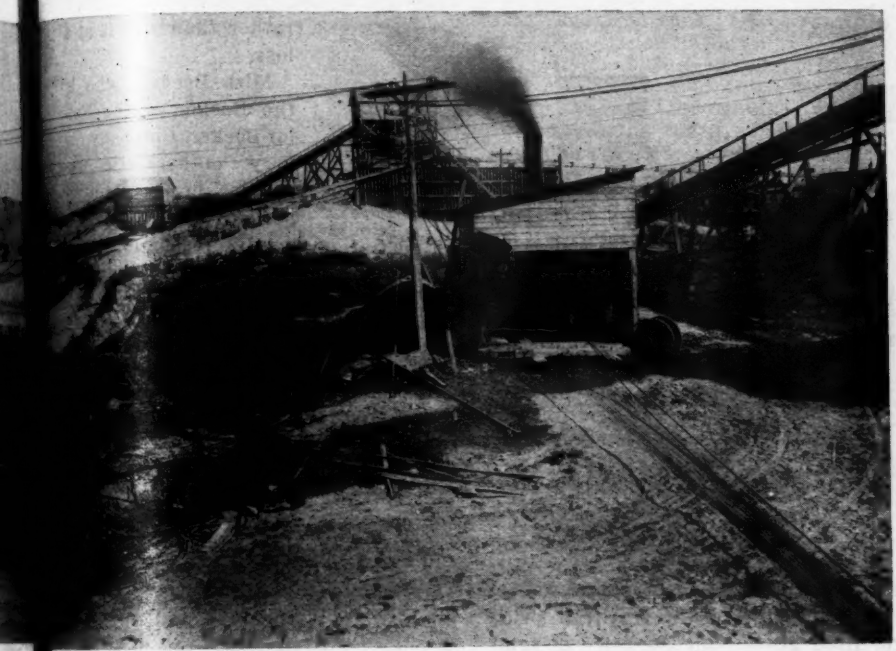
THE Fuller-Becker Sand & Gravel Company, whose plant is at Oxford, Mich., and who have general offices in Detroit, is credited with being one of the best and most modern plants in Michigan.

The plant is operated throughout by electricity, with the exception of three Thomas steam hoists, and is equipped with flood lights for night operation.

The plant was designed and constructed by Raymond W. Dull, now connected with the Link-Belt organization.

Material is obtained with three drag-line excavators, and fed directly onto conveyor belts, which elevate it to the screening and washing house. Here it is washed and graded into respective bins.

Dull Drag Line

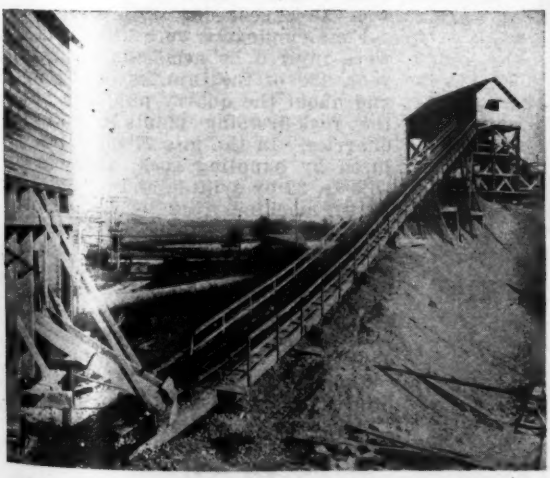


Company at Oxford, Mich.

The oversize material is fed by gravity from the screens to two Acme crushers, and then conveyed to loading bins.

A 6-inch American well works centrifugal pump supplies water to the washing plant at present, but the company is considering installing a larger pump.

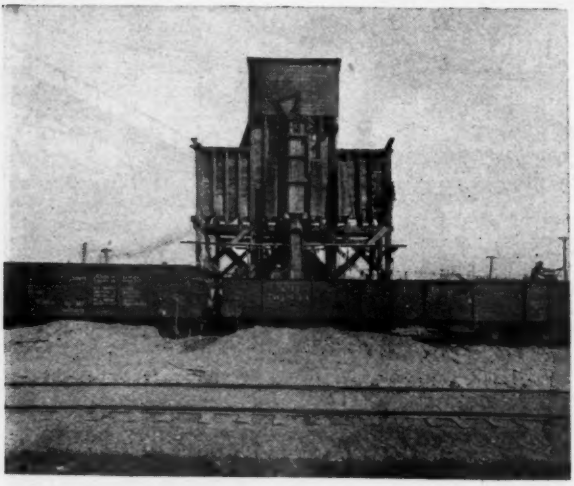
The plant is operating about 65 per cent of 24-hour capacity at present, and almost the entire output is going for road construction, and public works, such as sewer construction.



One of the Long Belt Conveyors

The city of Detroit recently started on a $90,000,000 sewer construction program, most of which will be of concrete. This is work which was held over from the war period, when work of this kind was necessarily stopped.

The company sells about 30 cars a day for road work, and the bal-



Delivery to Cars

ance for other kinds of public works.

They are getting a very fair price for their gravel, but the price of sand is so low that they are storing it, rather than sell it at a loss.

Miss Becker, who is the Becker of the Fuller-Becker Company, is very enthusiastic regarding her company—perhaps because she is partly responsible for its marked success.

Thomas Hoist

Men in Marble Quarries

Reports received by the United States Bureau of Mines from operators of marble quarries throughout the country show that 4,438 men were employed in the industry during the year 1920; that each man averaged 294 working days during the year; and that the total number of shifts worked by all employes was 1,304,552. The number of employes and the total number of shifts represent an increase of 11 per cent each as compared with the record for 1919, while the average working days per man is the same as for the previous year. More men were employed at marble quarries in 1920 than in any year since 1916, and the total shifts worked by all employees was the largest since 1915.

Four employees were killed and 400 were injured by accidents during the year, 132 of the injuries occurring in and about the quarry pits, and 268 at the rock-dressing plants outside the quarries. In the pits 27 men were injured by handling rock, 22 by flying objects, 22 by drilling and channelling, 15 by machinery, 12 by falls of persons, and 11 by timber of hand tools. At the outside rock-dressing plants, 162 men were injured by handling rock, 30 by machinery, 16 by nails and splinters, 15 by haulage accidents, 13 by falls of persons, and 11 by flying objects.

Considered by states, 231 men were injured at quarries in Vermont, 29 in Tennessee, 26 in Georgia, and 24 in Missouri.

Marble quarries employ approximately five per cent of all quarry workers in the United States.

Boiler Hints

FROM time to time in this journal have appeared articles on boiler efficiency, considering many things that mean a larger amount of water evaporated by a pound of coal. This is what every boiler is operated for, and if less than seven pounds of water is evaporated at a temperature of 212 degrees by a pound of coal, the boiler is doing poor work. The evaporation under favorable conditions should exceed eight pounds of water to a pound of coal.

There are many things that the fireman can do that will make the boiler more efficient even if it is not equipped properly. These can be mentioned under Boiler Hints:

1. Keep the ash pan bright. A bright ash pan means a live fire, a dull one means dead ashes on the grate.

2. Keep the ash pan clean of ashes. A pile of ashes cuts off the draft. A large amount deadens the fire and an excessive amount will burn out the grate bars.

3. It is bad practice to throw water in the ash pan or hot ashes as the steam generated injures the boiler settings and also the boiler, especially in locomotive types and Scotch boilers. Instead, take the ashes out of the ash pit.

4. If the boiler is steaming too rapidly, don't open the fire door; instead close the ash pan doors.

5. Fire doors kept open cool off the crown sheet and prevent the boiler steaming.

6. If a slice bar has to be used much there should be a hole in the fire door to take the bar, thus saving opening the door.

7. A T-bar is better for cleaning a grate than a slice bar.

8. Keep clinkers out of the fire, as they cause more clinkers to form and deaden the fire.

9. The best type of grates will prevent clinkers from forming and shear up those that form.

10. Don't carry too deep a fire unless you have forced draft. With natural draft a light fire will give better results and save coal.

11. Keep the back part of your fire as clean as the front part.

12. If holes burn through the fire don't blanket them by throwing green coal in the hole, but use an evener to level up the fire and if additional coal is needed spread it over the surface.

13. To bank a fire, clean some part of the grate either one side or the back, so as to allow the draft to go through an open grate instead of through the bed of coals. Close ash pit doors and damper and bank with a good covering of green coals. If you open the fire doors the cold draft may cause the tubes to become leaky. A fire will keep and steam will hold for hours by following these directions.

14. Firing up too rapidly when the boiler is cold and the water is likewise cold will cause seams and tubes to leak.

15. Not only gage cocks should be tried for water before starting up steam, but water should appear in the glass.

16. At least once in ten hours blow off a gauge or more of water, when there is a good pressure on the boiler.

17. Do not carry too much water in the boiler. There must be ample room for the volume of steam needed. Plenty of water in the boiler just before blowing off is a good thing, as it will leave ample water and steam to run the pressure gauge up quickly.

18. If a hot water feed is not used, but cold water is fed into the boiler, take in the water in small amounts so as to prevent reducing the temperature of the boilers too much.

19. Soot should be blown out of tubes and breeching at least once a day.

20. The back combustion chamber should be kept cleaned of combustion ash.

21. Tubes should be cleaned of scale at least once a week.

22. Give a boiler a thorough cleaning at least once in every two weeks.

The Staso Milling Company and the Vermont Milling Products Corporation, operating near Castleton, Va., are electrifying their slate works, and the majority of equipment will be operated in this manner. Service will be furnished by the local electric utility company.

Belt Conveyors

By DANIEL J. HAUER

IN A RECENT article published in PIT AND QUARRY, the writer, at the request of a reader, described a ground storage system that would be available for crushed stone, sand or gravel, in which the material would be stocked by belt conveyors and rehandled to cars or trucks by the same type of machinery. No attempt was made to cover the subject of belt conveyors in an exhaustive manner, but only to answer the question of a reader as to handling material to and from a stock pile. It must likewise be understood that the reader suggested two parallel storage piles, while the writer, except under unusual conditions, would only use one pile as will be explained.

The article in question has brought a number of inquiries regarding various features of belt conveyors, and it is deemed advisable to answer these in another short article.

It has been shown how by a movable tripper the load from the conveyor can be deposited at any place desired, the tripper discharging on either side of the conveyor. Just as this tripper is moved, there can be swung under it a movable cross distributing conveyor as shown in Fig. 1. Thus after the tripper has built up a pile of material, this distributing conveyor can be placed under the tripper and the pile widened on each side with this device, the load dumping off the end of the belt.

This makes it possible to add materially to the size of the stock pile, using the same overhead and rehandling conveyors, which could not be done by the method outlined in the former article. This means a much cheaper installation for a large stock pile of nearly the same capacity as that shown under the two conveyors in the former article. It would be possible to use three rehandling belts if this were found necessary, but again this would add to the cost of the plant.

The only way to place material from a belt conveyor exactly where desired is with a tripper. These are of several kinds and are moved by power or hand methods.

The angle of incline of the belt on the tripper is fairly steep, in some cases as steep as it is possible to have it and carry stone. For this reason a long base tripper is superior to one with a short base. Care must always be exercised in selecting trippers.

For belt conveyors 18 inches or less in width, if it is not desired to deposit the material at an exact spot but only within a given length as in a pile or bin, it is possible to do away with the tripper, using under the belt an adjustable carrier mounted on a bracket that can be tilted to either side, thus tilting the belt and discharging the load. This makes possible a cheap installation for a small capacity of output from a set of screens or bins.

In handling belt conveyors, their success may depend entirely upon the manner in which they are fed. The conveyor can readily be choked by feeding too rapidly. The capacity of the belt can only be obtained by regular feeding and having the load uniformly distributed. The life of the belt will depend upon the way the material is chuted onto the belt. The material to be conveyed should, if possible, be chuted onto the conveyor at the belt speed. This can be accomplished by automatic feeders, by properly constructed chutes, discharging elevators, or by jiggling traps with gates to allow the material to be fed regularly and with the proper speed. A carrier must never be located di-

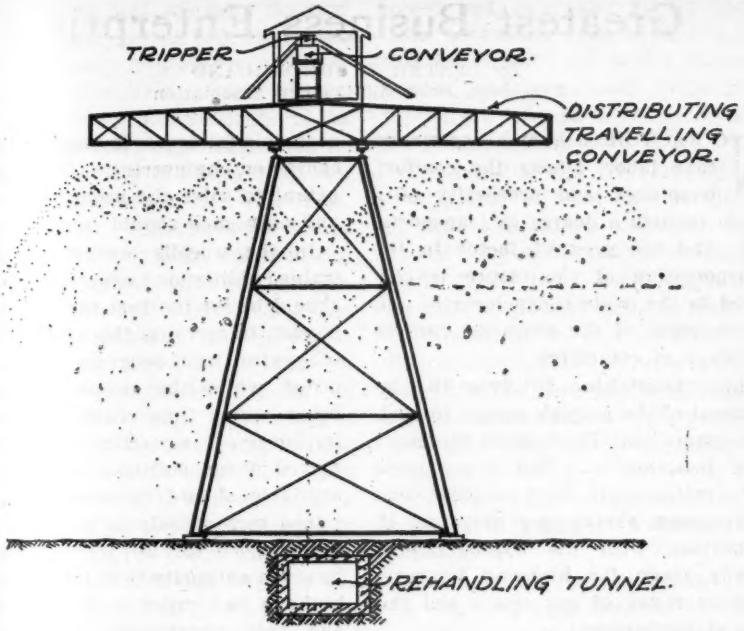


Fig. 1—Cross-section showing how a stock pile can be widened

rectly under where the material is fed upon a conveyor.

A belt conveyor can be run up an incline but the angle should not exceed 20 degrees. Conveyors of this type have been successfully operated with angles as great as 25 or 26 degrees but they must be of special design. It is for this reason that a belt must be run level when a tripper is used. Thus to elevate to a stock pile, the belt is run on an incline until the first point of discharge is reached, when from there on it is made level. The adjustable carriers can be used on an incline, dumping before it reaches its maximum height.

If it is desired to use a larger angle than 20 degrees, another type of conveyor should be used. Up to an angle of 30 degrees an apron conveyor can be used. This is generally an all-steel conveyor and is much more expensive than a belt conveyor. It must discharge at the end, and can be arranged to elevate material and discharge upon a belt conveyor.

If greater angles must be used, then a pivoted bucket conveyor or carrier should be employed. This can be operated at any angle, even being used for a vertical raise, then running off on the level.

Naturally a bucket elevator can be installed for any very steep incline or vertical raise, being cheaper than a pivoted bucket carrier.

Thus belt conveyors in connection with other types of conveyors or elevators can be made to be a very flexible means of transporting pit and quarry products.

They must be laid out along good engineering practice and following engineering principles.

The American Farm Bureau Federation through State Farm Bureaus, is making a drive to secure a very material reduction in freight rates on agricultural limestone and lime.

Greatest Business Enterprise

By LESTER T. SUNDERLAND
President, Portland Cement Association

NO FACTOR in human experience, save labor, affects the comfort, happiness, and prosperity of a people to such a degree as transportation; and the greatest factor in the transportation of the future is contained in the modern development and improvement of the countless railless highways of commerce.

This undertaking involves the investment of the people's money in such large sums that it staggers the most vivid imagination. The investments of the railroads, in their palmiest days of expansion, shrink to paltry sums in comparison with the appropriations already made for highway improvement by many of our states and the Federal Government.

Not only has real activity in this great enterprise hardly begun, but it may be truly said the people generally have little conception of either its magnitude or import, and are not sufficiently informed of its potentialities to give it such intelligent consideration as would be imperative to the success of any large undertaking; and if the disastrous consequences of incompetence and mismanagement are to be prevented the people must be awakened to the danger.

Can one conceive of the vast sum of five billion ($5,000,000,000) dollars being spent for public highways alone? Yet approximately that sum is to be spent in America during the next ten years in railless-highway development; more than one-fifth of that amount has *already* been appropriated.

Now, the question is, How is this fabulous sum to be spent? *By whom*, and *for what?* Obviously, the greatest business enterprise in the world's history cannot be successfully carried on by novices or the driftwood of society's economic failures. It requires the best character, engineering skill, and ability extant to solve the problems involved, and only such should be employed.

In the world's market for brains, trained ability, and experience, the bids should be for the best that money will attract, to carry on this colossal work; otherwise true progress will be impeded while the people's money is being worse than wasted. Highway-improvement activities should be divorced from politics; the best men available should be selected, and retained permanently or as long as they render good service; and they should be given authority to build the types of highway best suited to the traffic needs, and held accountable for so doing. What business undertaking could succeed if the management were periodically changed? How important it is that the development of the great modern highways shall not be characterized by the waste and corruption often incident to political changes and interference. The great Lincoln's advice, "It is no time to swap horses when you are crossing the stream," is as pertinent here as in the circumstances under which it was given.

There are many types of hard-surfaced highways, but the test of long experience under the most severe traffic conditions should decide the choice. That type which, under modern truck and automobile traffic, over a stretch of fifteen or twenty years, will afford—whether wet or dry, hot or cold—an even, hard, safe, dependable, all-the-year-round road, for the lowest ultimate total cost (namely, first cost plus maintenance) is the type that will always be chosen by the best-informed and most conscientious engineers, where funds are available to build

them, since *the best*, whatever the first cost, *is cheapest* in the end. Such are the great modern improved white highways of Wisconsin, Pennsylvania, Michigan, Ohio, Connecticut, New York, California, and other states, which are not only of national renown and attract millions to ride over them, but in their consummation have created and built into the communities they traverse untold millions of wealth, compared with which their cost has been as nothing and in their processes of development the eminent and nationally-known highway experts of those states are building monuments of such enduring character and permanent usefulness to society that their names will go down in highway history as among the greatest benefactors of the commonwealths which their abilities and expert knowledge have served.

The *permanence* and *utility* of a road *should be built into it at the outset*, both of which can be attained by the adoption of suitable type and design, and honest construction under proper supervision.

Drag Lines for Sand and Gravel

THERE are many sand and gravel pits that are now being excavated from the bottom of the pits, and due to the great amount of ground water, pumps must be operated day and night. The extra cost in such cases is not only the cost of pumping, but also the cost of hauling the material up an incline or a steep grade.

There are several methods of overcoming these two expensive features of pit work in producing sand and gravel. One is with a slack line cableway or several cableways installed in one pit. This system is an excellent one especially for small operations. The fact is that in some cases, this method of excavation has been followed and sand and gravel propositions have been made to show a profit that would not have paid if any other method had been used. This is due to the low cost of the plant and also its low operating cost.

The objection to it for large production is that at least half of the time of any cableway is consumed in the empty skip or bucket returning for a load. Thus in a large operation it means a number of units of plant with an increase cost for each unit.

A second method of excavating under water for such pits is by means of a drag line excavator. This machine is generally mounted on caterpillar traction, so it can go over either rough ground or soft wet places, and is so built as to swing in a circle of 360 degrees.

The drag line is operated on a boom, varying in length from about 60 feet to 120, according to the build of the machine and capacity of bucket. Buckets up to five cubic yards have been used.

The machine stays on top of the ground, and the bucket is let down into the pit below the surface of the water, digging a load and delivering it anywhere within reach of its long boom.

Thus wagons can be loaded, also trucks and cars, and by means of movable conveyors and hoppers, the material can be carried directly to a washer or bins. The sand being wet, when that material is dug, means it will heap itself, so its is easily piled or carried on a conveyor.

These drag line machines, even of large capacity, are operated by a small crew, seldom over four men being needed including those on the machine and upon the ground.

Dragline excavators have been used for more than a decade, so are tried out machines, but they are just becoming well known as economical excavators for material under water.

Springing and Stemming Blast Holes

IN making large blasts in quarries there are two features of the work that many quarry men seem to think are not necessary. The first one is the springing of the holes.

Today, mostly dynamite is used for blasting in quarries, and a large number of operatives, acting on the belief that dynamite shoots down, consider that if a large charge is placed in the bottom of a hole, even if the load does go up into the bore of the hole for some feet, that the effect of the explosive is still downward so that springing is not necessary.

This idea is fallacious, for dynamite does not shoot down any more than it shoots in any other direction. The real fact is that dynamite exerts the same pressure in all directions and does the greatest amount of work in the path of least resistence. Consequently if a charge is to give the best results it should be placed in a chamber at the bottom of a drill hole. The charge then can be better confined and it will loosen and break up a larger tonnage of rock to the pound of explosive.

A loading chamber is obtained by springing the hole, using enough tamping to confine the charge and thus making the springing charge make a port or chamber. If properly handled each successive springing charge will enlarge the chamber.

A rule to follow in springing is to gage the first charge. Thus if two sticks of dynamite are used in the first charge and it is possible to get six sticks in the chamber thus made, for a second charge, without the load going up into the bore of the hole, the ratio of loading is 3 to 1. Thus for the third spring 18 sticks can be used, and if this makes a large enough chamber 54 sticks or about 27 pounds can be used in the final blast. This should be charge enough, if the hole is properly placed, to throw out of the ledge from 120 to 150 tons of rock.

Should the overburden on the hole be such as to stand a further spring the charge for springing would be 27 pounds or 54 sticks, allowing from 81 to 100 pounds of explosives to be used in the blast. This should loosen from 400 to 500 tons.

Such blastings would be in holes of 1 or 2 inches in diameter. For well drill holes it is possible to use half a dozen or more sticks in the first spring. If the second spring will take 12 sticks only, then the ratio is 2 to 1, but frequently in such large holes the ratio may be 4 to 1. Thus the springing charges are larger and less springing will have to be done.

These ratios are not always accurate but experience has proven that they are true in most cases and they have been found a great help in making economical blasts.

The size of the chamber is told by keeping measurements on the loading stick, for as soon as the bore of the drill hole is reached, the fact is told by the height registered on the stick.

All holes, except very shallow ones, six feet or less in depth, should be sprung, unless unusual conditions are encountered. By this springing the efficiency of a blast can be increased from 25 to 100 per cent.

Another way of increasing the efficiency of the blast is by stemming or tamping the charge. This is the other feature of blasting referred to in the opening paragraph.

Not only should the charge be stemmed, but also the various springing charges. These, though, will not need as much stemming as the main charge. The need of this stemming is to prevent the charge from doing

its effective work along the path of least resistance which is the barrel of the drill hole. This can be seen illustrated in springing when the light charge will shoot out of the hole, the stemming tamped into it, just as the load is shot out of the barrel of a gun by the powder in the shell.

There should always be enough stemming placed in the hole, and it should be so compacted as to hold the charge down and make the blast as effective as might have been possible if by some miraculous way the explosive could have been placed within the ledge without drilling a hole and springing it.

In order to do good tamping there should be fine materials that will flow well and pack tight. Sand will do this, also light loamy clay, but quarrymen have on hand, as a rule, crusher dust that makes excellent stemming material. For just over the explosive and up into the bore of the hole the crusher dust should be screened to get out the coarse particles to prevent any friction occurring that might set off the charge. After the charge is covered well with the finer dust, the regular run of the screen can be used.

This stemming of holes has also shown that the efficiency of the blasting is materially increased. With the present high price of explosives, anything should be welcomed by the quarrymen, that will reduce the cost of blasting, yet give better results.

Pass It Down the Line

Let Every Interested Man Have a Chance to Read Pit and Quarry

ONE manufacturing concern which is incidentally interested in the stone business uses a blank like that here shown to insure the handing of PIT AND QUARRY to every interested man in the organization.

This blank is gummed on the back, so that it can be readily attached.

It is an idea which is worth using, and can be varied to fit the needs of any organization.

Please check when through reading and place in basket for delivery to the next department

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	Asst. to Pres. C. W. LaPorte		
	Comptroller—A. J. Snyder		
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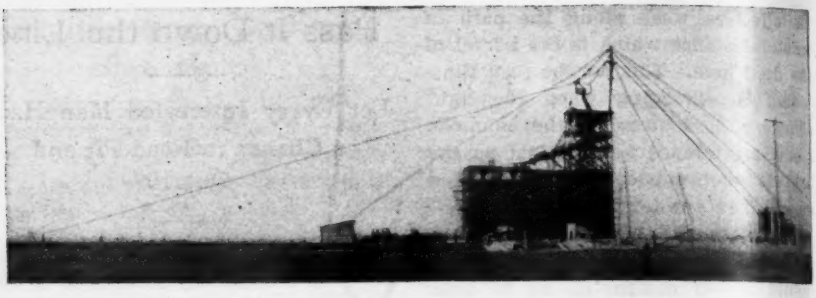


Another New Iowa Plant

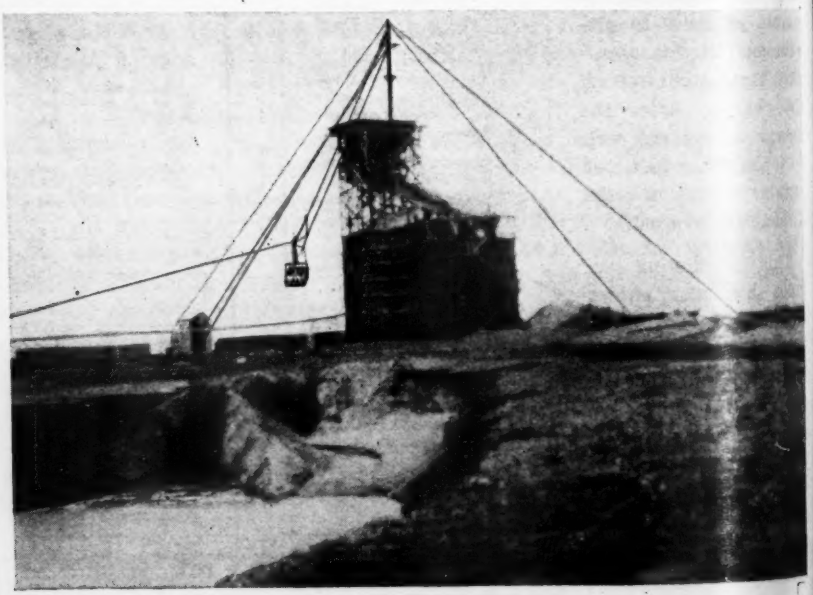
Clear Lake Sand and Gravel Company Begins Operations

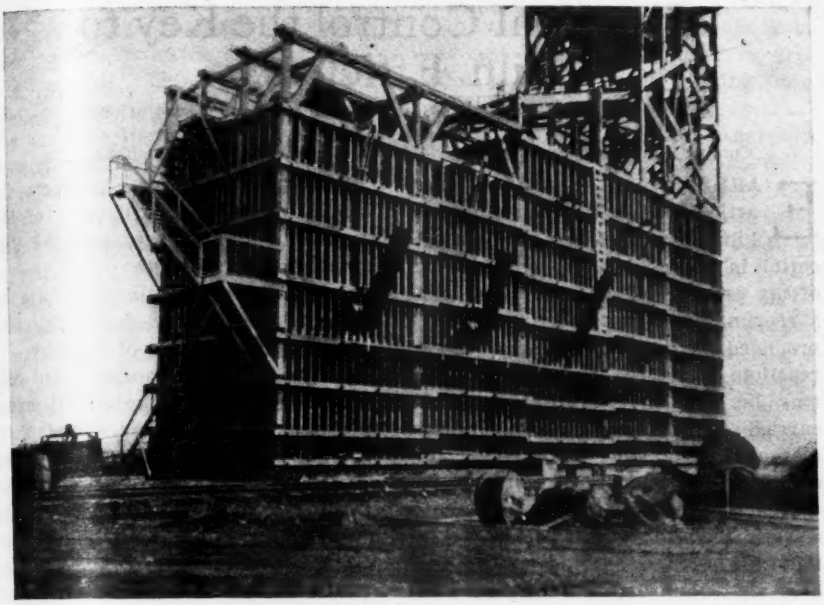
THE Clear Lake Sand and Gravel Company, whose plant was nearing completion when we visited it early in April, is now running to capacity, and turning out an exceptionally fine grade of washed and graded sand and gravel. The capacity is between 20 and 30 cars per day.

The plant is ideally located as to transportation and accessibility of material. It is just outside of Clear Lake, Iowa, and lies between the Chicago, Milwaukee and St. Paul, and the Mason City and Clear Lake railroads, with sidings from both roads running to the loading bins.

The company owns 150 acres of land containing extensive deposits of high grade material. The plant was built by Mr. H. D. Keerl, who is also vice-president and general manager, from designs furnished by the Link-Belt Company, who furnished the washing and screening equipment.

The equipment consists of a scrubber and three screens, which will furnish three sizes of gravel, and two settling tanks, which will wash and





grade two sizes of sand. Provision is made for the installation of another set of screens and settling tanks, which will double the capacity of the plant. A 20-horsepower electric motor will drive the scrubber and screens.

A Sauerman Dragline Cableway, operating a one and one-half yard bucket over a span of 650 feet, delivers the material to the screens, power being furnished by a 150 horse-power two speed Thomas Electric Hoist.

An American Well Works 5-inch centrifugal pump, driven by a 150 horse-power electric motor, pumps 900 gallons of water per minute to the washing plant from a creek, about 1,000 feet distant, through American spiral pipe.

An unusual feature of this plant, is that it is equipped to operate at night. The entire plant is electrically operated and lighted and flood lights are installed which will make it possible to operate on a twenty-four hour schedule, should business warrant it.

The electric current is furnished by the Mason City and Clear Lake Railroad, and is transformed down from 13,200 volts to 440 volts for power, and 110 volts for lighting, using 75 K. W. A. transformers. The transformers, and all electrical equipment are furnished by the General Electric Company.

A No. 5 gyratory crusher and bucket elevator will be installed in the near future, to handle oversize material.

The officers of the company are: E. H. Rich, president; H. D. Keerl, vice-president and general manager; F. W. Rich, treasurer, and R. R. Rogers, secretary. F. A. Rich, A. N. Grimm and H. M. Konklin are also interested in the concern.

It is men like Mr. Keerl—men who have the courage, and the confidence in the future of the industry to go ahead and build, despite adverse conditions, despite high freight-rates and possible car shortage—who put truth into the slogan of the State, "Iowa Welcomes 1921." It's a good slogan, that—demonstrating the kind of spirit that turns failure into success, the spirit that WINS.

Chemical Control the Key to Kiln Efficiency

Paper read at convention of National Lime Association.

By W.D. MOUNT, M. E.
Consulting Engineer, Peoples National Bank Building, Lynchburg, Va.

EARLY in 1919 I wrote a short article on certain principles in kiln operation, and their application in kiln construction. The basis of my argument then, as now, lies in a recognition of the fact that lime is produced as the result of a chemical reaction, and that while the process may be, and in many instances is, carried forward by rule of thumb methods in complete disregard of the chemical and technical factors involved, nevertheless, it is only through a very definite recognition of these factors and their bearing on the process that the road can be found to the attainment of the highest efficiencies and economies in operation.

In my former article the subject was treated more particularly from the standpoint of the specific factors of design necessary to complete Chemical Control of the process; now, however, I wish to approach the matter of Chemical Control in kiln operation from a little different angle, and to point out what it has done in the Lime Department of one of the most highly specialized industries in the world. I refer to the manufacture of Sodium Carbonate, or the Soda Ash of Commerce, from common Salt by the so-called Solvay, or more correctly, Ammonia Process, with which industry I was for twenty-five years, until November, 1918, actively connected in a managerial capacity.

The operators of the above mentioned process are usually referred to as Alkali Manufacturers and their products as Solvay Alkali. These comprise, in addition to the carbonate in its varying grades and densities, the hydrate or caustic, Bicarbonate, Sesqui carbonate, and a number of combinations of these products for special purposes, particularly of the Carbonate and hydrate and the Carbonate and bicarbonate.

Soda Ash enters, in one form or another, directly or indirectly, into about all the poducts of industry.

It is a fact, altho probably not generally known, that the Alkali manufacturers are among the very largest, if not the largest, individual producers of lime in the country, though none of the lime produced is for commercial purposes, except indirectly as it enters into the manufacture of alkali in the several forms mentioned, together with numerous other soda products based on the carbonate as a raw material.

A brief description of the Ammonia Process for the manufacture of Alkali and the function of Lime in connection therewith may not be out of place at this time and of general interest to the members of the Lime Association.

The process hinges on the comparative insolubility of Sodium Bicarbonate in a cold solution of salt, or brine. The principle raw materials are salt, (NaCl), Limestone, and Ammonia; the latter usually in the form of crude liquor from by-product coke ovens; large quantities of coal and coke are also required. The salt is usually and in this country exclusively, in the form of a saturated brine pumped or forced from underlying beds of rock salt at depths varying from 300′ to 2000′ in different parts of the country. The saturated brine enters the process directly as it comes from the wells, and without treatment for purification. After passing through certain washers for the purpose of scrubbing exit

gases, carrying ammonia, it enters the absorbers, in which it is saturated with ammonia. This operation is accompanied by the evolution of heat. The ammonia deliverd to the absorbers and a certain volume of CO_2 gas along with it react on the impurities in the brine, principally Calcium, and Magnesium Salts, precipitating these impurities as a sediment, or mud, which is settled out as the brine passes through a cooler from whence it is pumped to the carbonators, where we have the first indirect contact with the raw material, Limestone.

Limestone is burned in connection with the manufacture of Soda for two purposes; as a source of CO_2 (carbon dioxide) gas for carbonating the ammoniated brine, and to furnish lime used in a secondary distillation process for recovering the Ammonia. Disregarding the intermediate steps of the reaction, the essential and final result in the carbonators from treating the Ammoniated Brine with CO_2 Gas is Bicarbonate of Soda and Ammonium Chloride. The last mentioned is in solution, and represents that portion of the raw material, Salt, decomposed. The Bicarbonate, precipitated, together with the Ammonium Chloride above referred to in solution, is drawn continuously from the carbonators, the Bicarbonate separated by filtering, and the filtrate sent direct to the Stills, where the Ammonia is recovered by distillation with Lime, according to the reaction:

Ammonium Chloride + Lime = Calcium Chloride + Ammonia.

The Ammonia comes off as a gas, together with a considerable volume of CO_2, is cooled and piped direct to the absorbers, and the cycle is thus complete.

I might state here that all operations are continuous, running night and day, 365 days in the year, and under complete and constant Chemical Control.

The lime kilns in an Ammonia Soda plant are usually quite high in proportion to the diameter, ranging from sixty to seventy feet, with an internal diameter from one-sixth to one-seventh of the height. They are operated under induced draft, and coke is used as a fuel, being charged direct with the stone—extreme care is taken in adjusting the ratio of the coke to the stone, and also in the sizing of each; a six inch cube represents the normal maximum size for the stone and a two and a half inch cube for the coke. The latter is, as a rule, passed through a crusher, thence over a screen for the removal of dust and fine breeze. The kilns are charged through tight bells at the top in fixed quantities and at regular intervals. Cold lime is drawn from the kilns, either at regular intervals or continuously, the latter method being the latest practice. The draft is induced by direct suction of the large blowing engines or compressors, used for forcing the gas into the carbonators. The kilns are at all times under the same complete chemical control characteristic of all other departments, the following hourly records being made day and night.

Stone and Coke Charged, CO_2, CO, O, Vac., T°.

The correct ratio of coke to stone is determined by analysis of the coke, and adjustment of the burden, i. e., coke to stone ratio, until the maximum volume per cent of CO_2 is obtained in the exit gases consistent with a well burned lime at the kiln discharge. Once this ratio is obtained it is most rigidly held in balance by constant tests and observation. Both stone and fuel are either weighed, or carefully measure as charged.

The volume percent of CO_2, CO and O is determined hourly by means of an Orsat apparatus equipped with three absorption vessels containing the usual solutions for these gases—Caustic Potash for CO_2—Cuprous

Chloride for CO, and an alkaline solution of Pyrogallol for Oxygen. The Vacuum is measured in fractions of an inch of water and will vary from 1/10 to 3/10 of an inch, depending largely on the character of the stone and its tendency to fines in burning. Temperatures are measured by recording pyrometers and are maintained constant, once the kilns are adjusted to the rated output dependent on the scale of operation. All of the various operations in an Alkali Plant are peculiarly interdependent one on the other, and inefficient working or a break down of any portion is almost immediately reflected throughout the entire process. Moreover the disturbance will be felt for sometime after the defect has been remedied and with consequent loss in output.

Another reason for control is obvious when we consider that it will take the same amount of steam per revolution of the Compressors to pump a lean gas as a rich gas, and the pounds of CO_2 delivered with the former at the same R.P.M. are less than with the latter; moreover, the efficiency of carbonation is much better with a rich gas than with a lean gas. The quantity of the CO_2 gas in the exit varies inversely with the amount of coke charged as fuel, that is, the less coke the richer the gas, consequently constant efforts are made to use as little coke as possible and completely burn the stone. It is essential that the stone be completely converted to lime, or nearly so, as otherwise the consumption per ton of Soda Ash would be materially increased, which would result in an increased cost of finished product. The importance therefore of a careful balancing of the fuel and stone essential to a high exit gas, i e., a gas with a high CO_2 content, and securing at the same time a well burned lime, can be readily appreciated, as they not only vitally affect the general efficiency of the entire operation, but are closely related to cost of finished product. Only stone that is clean and free from dirt is used; the presence of foreign matter would cause clinkering.

With a high calcium, free burning stone, and with coke low in sulphur, and containing less that 8% Ash fuel ratios as high as one ton of coke to 12 and 13 tons of stone are not uncommon monthly averages. I have a record of one month where the ratio was one to fourteen. Daily chemical analyses are made of the limestone and coke used. As has been noted, the percent of CO_2 gas by volume in the exit is tested hourly. Nothing is left to chance, and the entire operation is under absolute and definite control by means of accurately taken and carefully recorded readings.

I have stated that the alkali manufacturers are among the very largest, if not the largest, individual producers of lime. In confirmation of this the files of the War Industries Board give the gross production of alkali, in the form of Carbonate, Bicarbonate and Hydrate, figured as Soda Ash, in 1918 as approximately 2,500,000 tons. With the best high grade calcium stone the consumption per ton of Ash can be, under exceptionally good working conditions, reduced to 1.2 tons of lime stone per ton of Soda Ash. This, however, I think on the basis of past experience, is lower than the average obtained in this country. I have, therefore, taken the consumption of stone at 1.3 tons per ton of finished Ash. At this ratio a yearly output of 2,500,000 tons of Soda Ash would call for 3,250,000 tons of limestone, equivalent to 1,625,000 tons of lime. The largest manufacturer of alkali in this country has a normal production of 1,000 tons of lime per day.

The Geological Survey reports a somewhat larger quantity, 3,437,000 tons of limestone, used by the Alkali manufacturers in 1918, equivalent to

1,718,500 tons of lime. Besides this the lime figures of the Survey show 145,031 tons of lime used by Alkali Manufacturers in addition to that produced from their own kilns. The corresponding figures for 1919 are approximately 2,260,000 tons of limestone and 95,000 tons of lime.

From data furnished by the National Lime Association I estimate the commercial lime production of the country in 1918 at 3,204,000 tons, or including that produced by the Alkali Manufacturers 4,829,000 tons, from which it will be seen that the Alkali industry produced approximately one-third of the total, or, if stated another way, the lime used by the Alkali Manufacturers was equal to one-half of that burned for commercial purposes.

It would seem axiomatic that a kiln of the shaft type, other things being equal, will have the highest fuel economy when so operated as to be cold at the top and cold at the bottom, and as a correlary its capacity will, under these conditions, be greatest when discharging continuously.

Also it may be stated that a kiln will be most efficient as regards fuel consumption where the fuel is burned in direct contact with the stone. Moreover, it will be seen that an efficient kiln is perfectly regenerative in action, the whole of the heat being conserved.

It will be interesting to determine how nearly the operation of the Alkali Manufacturers approximates the foregoing ideal conditions: First, it may be noted that in three particulars at least these conditions are fully met: A kiln cold at the bottom, fuel burned in contact with the stone, and continuous discharge. Furthermore since all air for combustion is drawn in at the bottom, the kiln is perfectly regenerative within the limits of the temperatures of the exit gases.

Taking the heat of decomposition of Calcium Carbonate as 775 B. T. U. per pound, the heat of decomposition of 1 ton of limestone will be $775 \times 2000 = 1{,}550{,}000$ B. T. U.; the average temperature of the stone as charged will probably approximate 50° and its specific heat .22; hence the range is $1904 - 50 = 1854°$, and the heat required to bring the stone to temp. of decomposition is $1854 \times 2000 \times .22 = 816{,}000$ B. T. U. and the total heat $816{,}000 + 1{,}550{,}000 = 2{,}366{,}000$ B. T. U. One ton of coke will yield on burning 29,000,000 B. T. U., which is enough heat to decompose 12.26 tons of stone under the ideal conditions mentioned.

It will be noted that the foregoing figures do not check exactly with the results obtained by the Alkali Manufacturers, and that their results as regards fuel economy are apparently in excess of those indicated under the ideal conditions assumed. However, it may be pointed out that the average of stone charged will probably range around 95% $CaCO_3$ and that the decomposition is not complete and also assuming this at 95%, we have $13 \times .95 \times .95 = 11.73$ indicating a kiln efficiency of

$$\frac{11.73}{12.26} = 96\%$$

It would seem from the foregoing analysis that the argument for Chemical Control in the burning of lime, as exemplified by the best practice of an industry using a tonnage equal to one-half of all the lime produced for commercial purposes, is clearly drawn and worth the serious consideration of the members of the National Lime Association.

A sand and gravel plant costing $250,000 will be erected just south of Massillon, Ohio, by the Greenville Gravel Company of Greenville. Three tracts of land, aggregating 100 acres, have been purchased and examination shows the property to be rich in sand and gravel deposits of high quality.

Linwood Quarry

That's the Name Schroeder Has Made Famous in Iowa and Elsewhere

THE Linwood Quarry, operated by the Linwood Stone and Cement Co., of Davenport, Iowa, is one of the oldest quarries in that section of the country.

It was practically abandoned for several years, until Mr. J. H. Schroeder, of the Linwood Stone and Cement Co., decided to start operation again.

A large amount of money was expended in new equipment and improvements of all kinds, and today it is one of the most efficiently operated plants in the state.

The company owns a large tract of land, and the quarry itself covers several acres.

The stone is broken up by blasting, the blast holes being drilled with two Clipper drills and one Cyclone drill. It is then loaded into cars by means of two Bucyrus Steam Shovels and one Thew Shovel.

The crushing equipment consists of a Worthington jaw crusher, size 44x48 inches, an Austin No. 7, and an Austin No. 5 gyratory crusher. A Williams hammer mill is used for fine grinding.

The plant has a capacity of over 2,000 yards a day, and its product is shipped as far as Des Moines, for general construction work.

Bucket elevators carry the material to elevated loading bins, which are built over a double track, so that the cars can pass directly under the bins, to be loaded.

There are about four cars a day of limestone dust, which is in great demand as fertilizer.

An Orton and Steinbrenner locomotive crane is used to move the cars, and for loading from the stock piles.

The managers of the company are constantly making improvements and enlargements to the plant, and are prepared to fill orders of any quantity promptly.

Mr. J. A. Thiessen is superintendent in charge of production, and is to be congratulated on his efficient handling of the plant and men.

The shovels shown in the illustration are Bucyrus, and are equipped with Taylor Messaba chain.

The plant is situated at Linwood, Ia., which is about six miles from Davenport, where the firm maintains general offices.

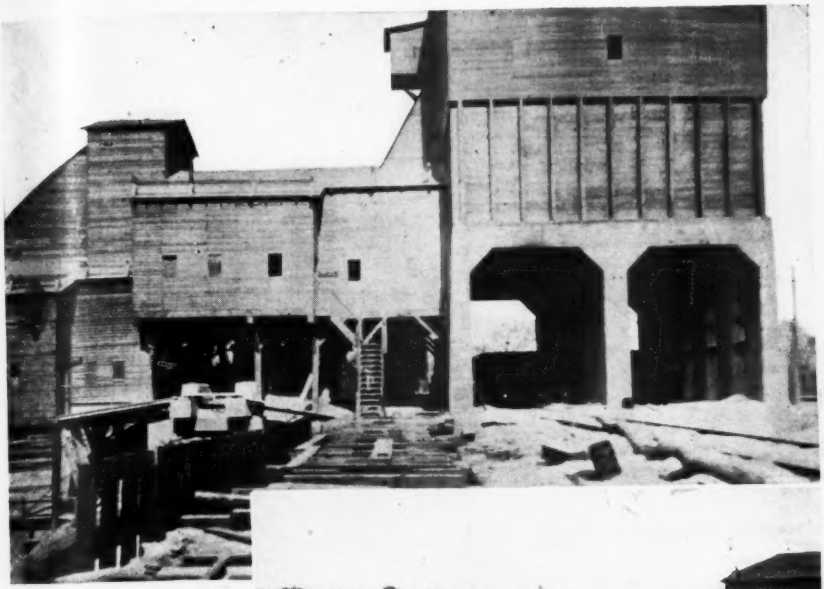
Accidents in Slate Quarries

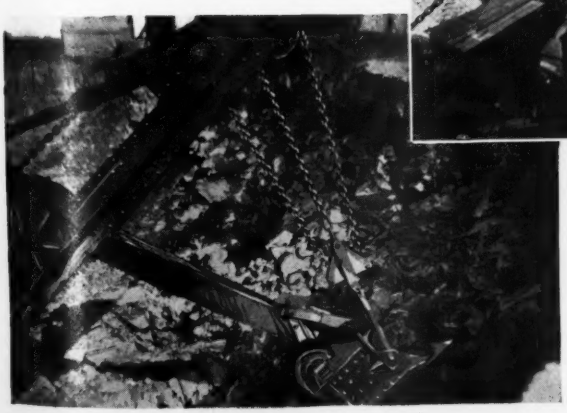
Reports received by the United States Bureau of Mines from operators of slate quarries throughout the country, show that 3,496 men were employed in 1920, as against 3,373 employed in 1919. Each workman averaged 289 working days during the year, the total number of shifts for all employees being 1,009,244, an increase of about 20 per cent over the preceeding year.

Accidents caused the death of 5 men and the injury of 364, showing a rate per thousand men employed of 1.49 killed and 108.20 injured, based upon a standard year of 300 working days. Of the total number of injuries, 224 occurred in and about the quarry pits, while 140 occurred at the outside rock-dressing plants. Of the accidents in and about the pits, 52 resulted from handling rock, 33 from falls or slides of rock or overburden, 19 from haulage accidents, 17 from machinery, 16 from flying objects, and 15 from falling objects. At the outside rock-dressing plants, 40 men were injured while handling rock, 29 by machinery, 20 by haulage accidents, 11 by hand tools, and 9 by flying objects.

All of the 5 fatal accidents occurred at Pennsylvania quarries, which produce about two-thirds of all slate quarried in the United States. Pennsylvania also suffered 272 of the 364 non-fatal injuries followed by Vermont with 77 men injured.

Slate quarries usually employ about five per cent of all quarry workers in the United States.





Views of the Linwood Quarry

THE PLYMOUTH GASOLINE LOCOMOTIVE

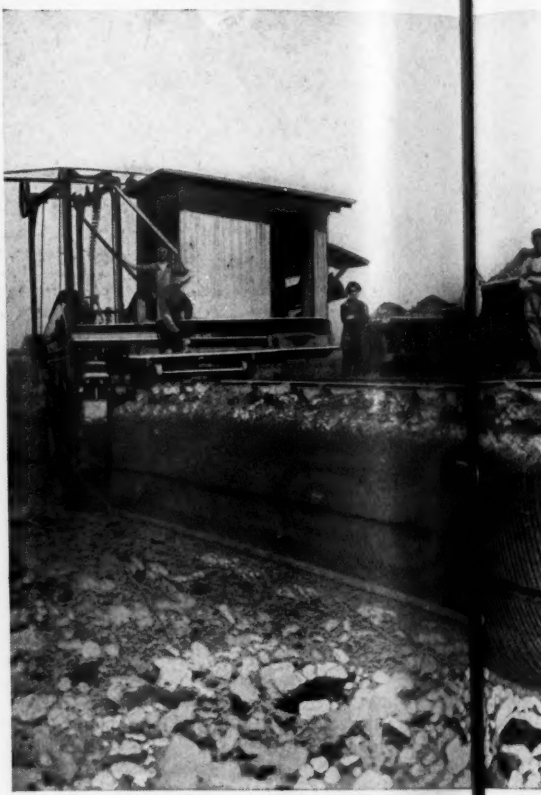
The first aid to those burdened with haulage problems. The hard working friend of the man who buys.

Practices economy in fuel and repair. Behaves so well that it inspires its owner to speak well of it.

Therefore, ask the man who bought and used.

POWER

Power that grips and seems to say "come on." No hesitation, no hint at insufficiency. As the old lady said when she saw the ocean, "there's enough of it."



The PLYMOUTH Gasoline Locomotive p s. The
Brick Co., Columbus, Ohio, it will take for y problem

THE FATE-ROOT-HEATH C P

PLYM U
Gasoline co

tive p... The burden it is taking for the Claycraft
for y... problem to the manufacturers,—

H C... Plymouth, Ohio, U. S. A.

M... UTH
e... comotives

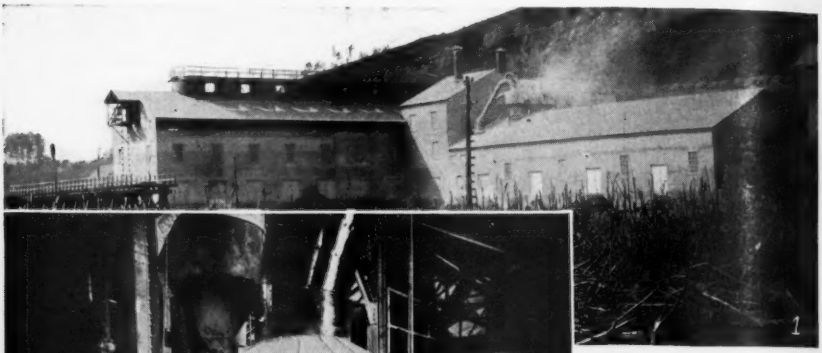
CLAYCRAFT BRICK COMPANY

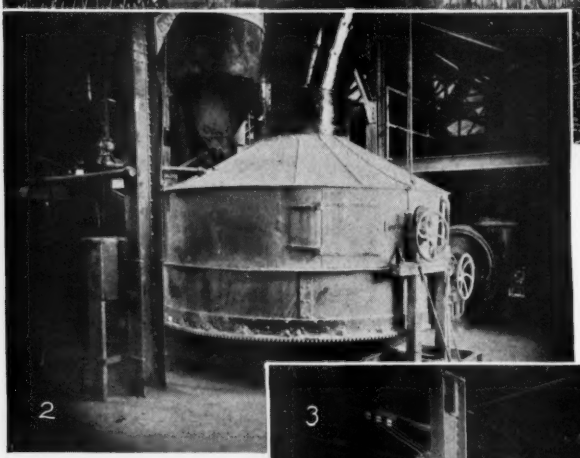
This company has lowered cost and increased production by putting a PLYMOUTH on the haulage,—displacing teams, wagons, drivers, and their attendant expense. They say:

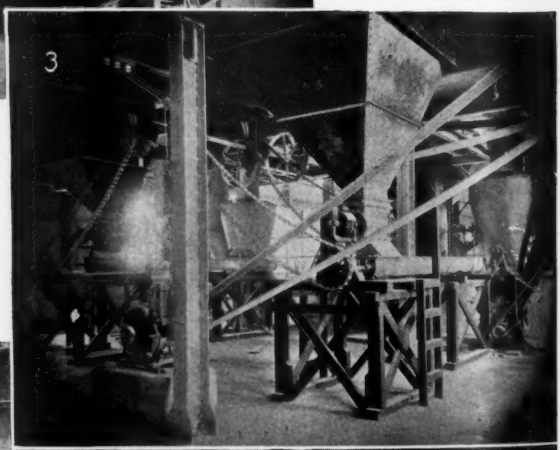
"We have convinced ourselves that the gasoline locomotive is by far the best machine for our use, and that the PLYMOUTH cannot be beaten by any other make."

UPKEEP

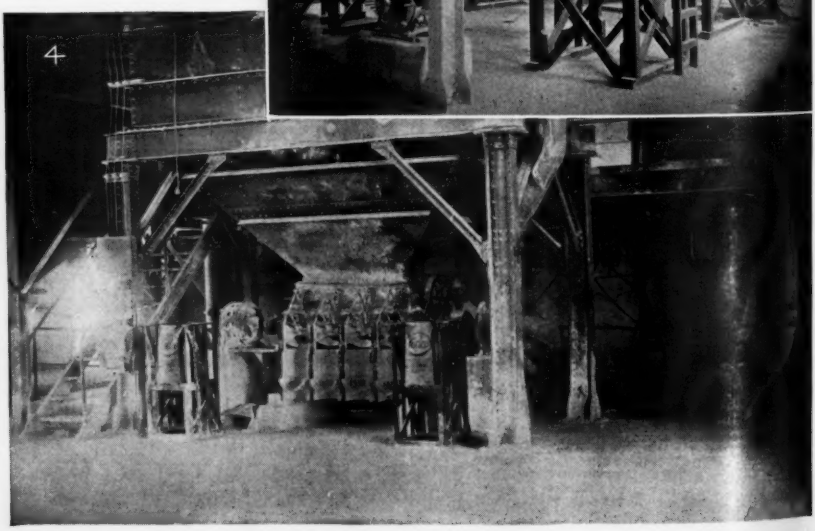
That's where the PLYMOUTH shines. Designed for service and built to deliver it. As Old Hampshire Bond would say, "made a little better than seems necessary." It's the "better than necessary" that makes the low up-keep.







Views of Ladd Lime and Stone Company



New Lime Plant of Ladd Lime & Stone Company

THE new hydrated lime plant of the Ladd Lime & Stone Company, was completed in February, although half of the plant has been in operation since September 1st, 1920. This plant is located at Ladds on the Rockmart division of the Seaboard Air Line Railroad, about three miles from Cartersville, Ga., and about 50 miles from Atlanta, and is one of the finest lime plants in the country. Richard K. Meade & Co., Baltimore, Md., prepared the plans and specifications and the plant was built under their supervision.

The Ladd Lime & Stone Company, has been operating, at Ladds, for several years a modern stone crushing plant, which has been a large producer of crushed stone for building and road purposes and of agricultural ground limestone. There are on the property the ruins of several old stone kilns which at one time furnished lime which was extensively used and well thought of throughout northern and central Georgia. No lime has been manufactured, however, by the present owners of the property in these old kilns and the new plant marks their entry into the lime industry.

The product is being sold under the brand "Ladco", the sales being under the charge of Mr. L. J. Backus, general manager, and Mr. E. L. Osborne, sales manager. The sales offices are in the Citizens and Southern Bank Building, Atlanta, Ga. "Ladco" has been extensively used for the past eight months in the South and has been pronounced the equal, if not the superior, of any hydrate on the market, not only for mason's work, but also for plastering and other more exacting work.

The plant draws its supply of stone from one of the largest deposits of dolomitic limestone in the South. In fact, it is one of the few deposits of high magnesian stone in the South. The quarry features are admirable, as the stone lies in a large hill which rises considerably above the low lands on which both the lime and crushing plants are located. The elevation of the present quarry floor is such that the cars may be brought down a slight incline from the quarry to the top of the kilns thus doing away with the need for a hoist.

The upper strata of the deposit consist of a very hard silicious limestone admirably suited to road material and crushed stone. The lower beds, however, consist of a very pure dolomitic (or high magnesian) limestone which burns to a clean white lime. The following analysis will give an idea of the purity of the stone:

Silica	0.90
Iron Oxide and Alumina	0.82
Carbonate of Lime	55.76
Carbonate of Magnesia	42.64

The general appearance of the plant is shown in Fig. 1. The kilns are located on the side nearest the quarry, next comes the hydrating plant and then a large storage shed.

All buildings are of steel, the roofs are galvanized iron and the siding is expanded metal plastered with cement stucco. The foundations are of concrete, the second floors are of reinforced concrete, while the ground floors are of plain concrete. All stairs are of steel. Galleries, treads to the steps, etc., are covered with Irving's subway grating and pipe railings are used. The machinery on the ground floor rests on concrete foundations and that on the upper floors directly on the steel work. No wood whatever has been used in the construction of this plant except for doors and windows, and it is a fine example of heavy fire proof construction.

The kiln building is 42x150 feet, the hydrating building 45x45 feet and the storage shed 45x120 feet. The hydrating and kiln buildings are separated from each other by means of a partition but the store house is practically a continuation of the hydrating building.

There are eight Meade kilns. These kilns were designed especially for this plant by the engineers, Richard K. Meade & Co., and embody all of their latest ideas on lime kiln construction. The kiln consists of a steel shell 11 feet in diameter and 35 feet high. This shell rests on a solid pedestal of concrete and terminates in a steel cooling cone. The shell is divided into two parts, the upper 5-feet section is unlined and forms a bin for the storage of the stone so the kiln does not have to be continuously charged. The lower section of about 30 feet is lined with fire brick and in this the stone is burned. The kiln is equipped with two furnaces, one on each side. The furnaces are provided with hand stokers. These are great labor savers, increase the capacity of the kiln 30 per cent, save fuel and practically eliminate core. These furnaces are supported on a reinforced concrete floor, level with the bottom of the shell and 12 feet above the floor on which the lime is drawn. This firing floor extends 12 feet beyond the fire box front giving ample space for the burners to work and on which to pile the coal for burning.

The cooling cone is of steel plate, is provided with a water jacket and is so placed that air can circulate freely around it. It is closed by quick acting swing doors which are operated by a pair of levers located at a convenient point.

Coal for the kiln is stored by means of a trestle 137 feet long with an average height of 12 feet. Midway along this storage is a bucket elevator, which carries the coal into a small bin located on the firing floor, and from this it is discharged into barrows and wheeled to the kilns.

The lime is discharged from the kilns through a chute on to a pan conveyor and the latter in turn discharges into a No. 2 Sturtevant crusher located in the hydrating building. This crushes the lime to ¼ inch after which it is elevated by means of a bucket elevator into a large storage bin above the hydrators and in the roof of the building. From the bin, the lime is discharged as needed into two weighing hoppers which weigh the charge for the hydrator.

There are two Clyde hydrators (Fig. 2) by means of which the lime is hydrated. Each is driven by its individual motor and has its own weighing hopper and water tank. The hydrators are located on the ground floor of the building and are arranged side by side so that one attendant can look after both machines. After passing through the hydrator, the lime is dumped into a small hopper capable of holding the charge from the hydrator, and from this it is fed by an automatic feeder to the pulverizer.

The pulverizing is done by the Raymond system, (Fig. 3) two of which are employed. Each hydrator is in series with its own Raymond system so that the hydrating plant consists of two entirely independent units, either of which can be operated without the other. In the Raymond system, the hydrated lime first goes to a No. 1 Automatic pulverizer, located on the ground floor. This mill is equipped with a throw-out which separates from the hydrate any core and unburned and unhydrated lime left in the product of the hydrator. These tailings contain considerable lime and hence are elevated by means of a bucket elevator into a small bin along side of the hydrate packing bin and are packed and sold for agricultural purposes.

From the pulverizer the fine product is sucked up by means of an exhauster and blown into a 7-foot dust collector, located directly above the packing bin. The exhausters are located on the ground floor and are driven by direct connected motors.

The packing is done by means of a Bates packer and Bates valve bags are used. (Fig. 4.) The packer is located in the storage shed and is equipped with a dust collecting system which makes the packing dustless. This system also takes care of the spill and hydrate from broken bags which collects on the floor.

The plant is driven throughout by motors, power being purchased. Each machine has its individual motor. The packing machine and the exhausters from the Raymond Mill are direct connected to motors. The other units are driven by means of either belts or chains. Back geared motors are used in the elevators. The elevators have steel casings and the screw conveyors steel troughs.

Why Plants Should Not Be Located in Pits

IN CONSIDERING the location of new plants or in changing the site of old plants, in pit operations, the writer has frequently been asked his opinion, or to make a report upon locating the plant in the pit.

At first glance it would seem somewhat logical to place a screening or crushing plant down in the pit. It means that surface developments are not interfered with in any way, and that space that is not available for other uses is put into use and this space is gradually being increased.

There are, though, a number of considerations that prevent locating plants in pits, except in a few unusual cases.

From a sand and gravel or a crushed stone plant there are generally secured from two to about six different products. This means that there must be bins in the pit for each product, and more than likely a conveyor, for each one, from the plant to a set of loading bins on the surface of the ground. Thus there would be a duplication of bins, for without them, an accident to a single conveyor would mean the shutting down of the plant.

If there were not a conveyor for each product, then the bins would have to be larger at the plant, so that there would be ample storage for those products that are not being conveyed from the pit. Such items not only involve an increased capital expenditure for the plant, but a heavy operating expense that would eat into the profits.

It will also be understood that in crushed stone operations, after the stone is crushed, the bulk to be conveyed and elevated from the pit would be greater than before it was crushed.

Likewise for pit quarries with heavy blasting going on, there is always the danger of the plant being either injured or ruined by a heavy blast. The danger is much less when the plant is on the bank.

In most pits water accumulates rapidly, so that if a plant has to be shut down the water quickly accumulates to a considerable depth. This means that with a plant located in a pit, either the water would destroy the plant or injure the machinery, or else pumping might have to be done daily. Even under the best conditions water might be a considerable handicap to the operator.

Service to the plant is also difficult at the bottom of a pit, and this is one of the important items when steam power is used. With electricity it may not be quite so important.

These are sufficient reasons why it is not advisable to place screening, washing and crushing plants at the bottom of a pit. H.

California Talc Industry*

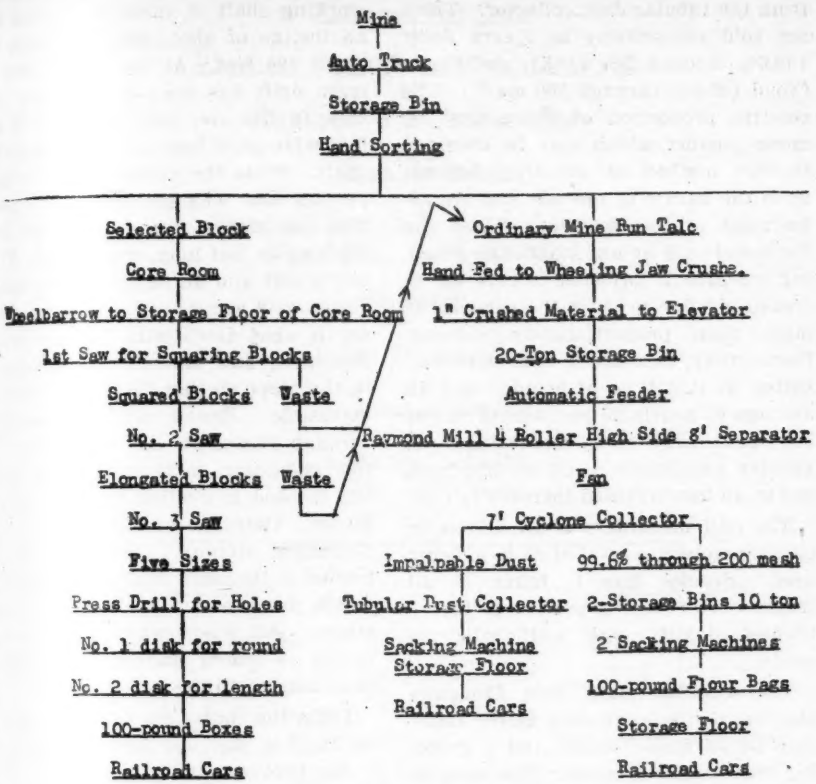
THE most important talc producing districts in California have been in San Bernardino and Inyo Counties, with the former leading, but some shipments have been made from Eldorado, Los Angeles, Tulare and Amador Counties, while deposits are known in several other counties. In Inyo County the principal deposits are located in the vicinity of Owens Lake and the principal producer in this district is the Inyo Talc Co., at Keeler. In San Bernardino County the principal talc deposits lie along the Tonopah & Tidewater railroad running from Ludlow to Death Valley Junction, and are located between the stations of Shoshone and Silver Lake on either side of the railroad for about 18 miles. The most important producing companies here are the Pacific Coast Talc Co., the Pacific Minerals & Chemical Co., and the Talc Products Co.

The leading talc deposits in California are located at some distance from the railroad and are handicapped by a heavy hauling cost. In addition the mines and mills are at a considerable distance from the chief markets, thereby being affected by the high freight rates. The present freight rates on talc from the Pacific Coast to New York and Chicago, are about $20 and $17 per ton respectively. From most of the mines in the Owens Lake and Death Valley districts to the grinding plants at Los Angeles the freight rate on talc varies from $3 to $5 per ton.

In general the problems of talc mining and milling are considerably different from those encountered in the eastern districts. Some of these differences are enumerated below. The deposits usually occur in an arid country, so that there are no pumping problems and it is not necessary to dry the ore before grinding. The deposits are generally in the form of small shallow lenses, rather than in extended veins. As the product is high-grade talc rather than industrial grade, mining is done on a small scale in a more or less intermittent and irregular way. All drilling and tramming is done by hand instead of mechanically. The mines are so far from railroads that costly, long distance haulage by motor trucks or tractors is necessary. In the best deposits the talc occurs practically free from impurities so that very little hand sorting for the removal of limestone, silica, etc., is necessary. There is small local demand for industrial-grade talc and the principal markets for high-grade talc are in the east, at a great distance from the mines. Unusual mining conditions, unfavorable location of deposits, and the high standards of quality for the finished product result in higher mining, milling and transportation costs than are general in the production of industrial-grade talcs in the east.

The Inyo Talc Company owns properties in the vicinity of Keeler, Inyo County, on the Southern Pacific Railroad. The grinding mill is located at Keeler but the mine is 18 miles distant. Keeler is the terminal of the Southern Pacific narrow gauge line connecting at Owenyo with the standard gauge. This company owns three deposits of talc, two of which are being operated and the third is being prospected. The talc occurs in dolomite as lenses of irregular size and shape, but the largest lens is shaped somewhat like a boat. The talc is massive and granu-

*Much of the information in this article is taken from an unpublished report by Byron O. Pickard, Mining Engineer, United States Bureau of Mines Experiment Station, Berkeley, California, and sent out by the Bureau of Mines, Washington, D. C.



Flow Sheet—Inyo Talc Company

lar, rather than fibrous or foliated, and the crude talc varies in color from a light, slate gray with a greenish tint to a pale sea green. The ground product is a clear, brilliant white. It contains practically no free silica and averages less than 1 per cent of lime (CaO).

The mines are opened by tunnels (adits) driven in the dolomite hanging wall. The tunnels are 4 feet by 6 feet in cross section and are timbered with sets. Cross-cuts are driven to the ore body, and drifts extended along the center line of the body.

The ore is broken down by a system of block caving and is removed from the mine by hand tramming in small, end-dump cars. At the surface the ore is dumped into storage bins, from which motor trucks are loaded for haulage to the mill. All drilling is done by hand and no timber is used in the stopes.

At the mill the ore is dumped into 200-ton storage bins, from which it is shovelled by hand into a Wheeling forced-feed, 6 inch by 12 inch jaw crusher. From the feed to this crusher are removed large sound blocks of talc suitable for sawing. These selected blocks are shaped into cores for heating elements of electrical heating devices, such as coffee percolators, etc. The waste from the saws is returned to the crusher and the crushed rock is then ground in accordance with the appended flow sheet. Two grades of ground talc are made, the regular Raymond mill product and the product

from the tubular dust collector. These are sold respectively as Sierra Snow (99.6% through 200 mesh), and Sierra Cloud (99.9% through 300 mesh). The relative proportion of the minus 300 mesh product which may be obtained in this method of grinding depends upon the nature of the talc and the adjustment of the machine. When the Raymond mill or any other fine grinding machine is adjusted to give an increasingly fine product the capacity is more than proportionately reduced. Fortunately, this talc is unusually well suited to this type of grinder and an average of nearly 15 per cent of minus 300 mesh product is maintained. A greater proportion could be obtained, but at an unwarranted increase in cost.

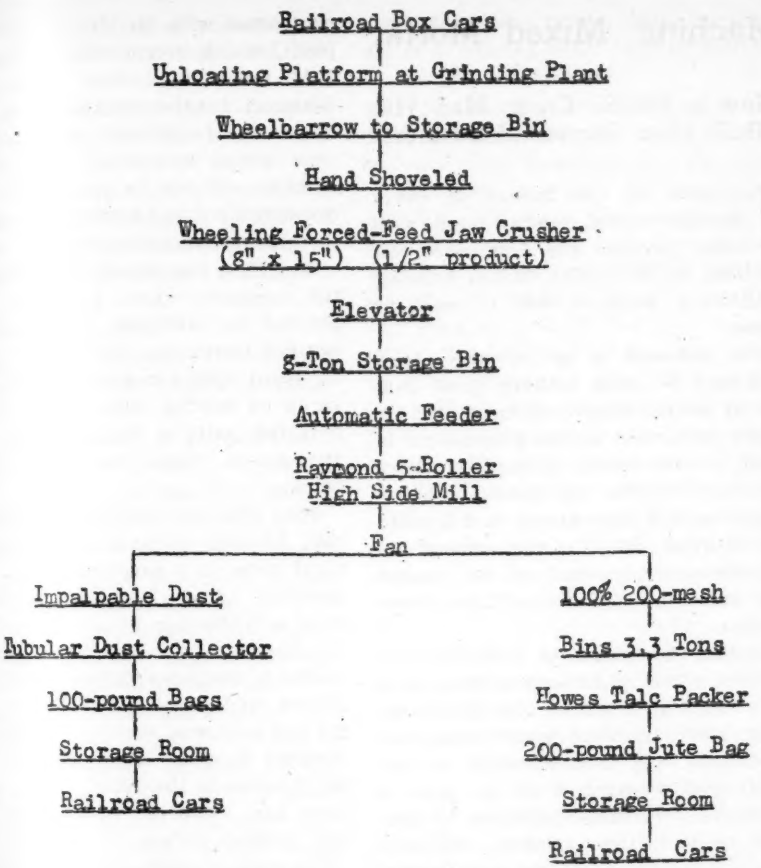
The mill machinery is all driven by electric motors, a total of 95 h. p. being used. Special care is taken in all stages of the milling process to insure highest quality and uniformity in grade.

The Pacific Coast Talc Company operates a talc mine near Silver Lake, San Bernardino County, and a grinding mill at Los Angeles. The mine is located about eight miles from the railroad and the crude ore is hauled by a 5-ton motor truck to the nearest station, Riggs, on the Tonopah & Tidewater Railroad. The crude talc is a pure, silvery white in color and has a foliated texture, somewhat resembling that from the Geo. H. Gillespie mine at Madoc, Ontario, Canada. The ground product is a very clear, silver white, with a very good slip, no grit and very little lime. A typical analysis shows 0.31% calcium oxide. The ore occurs chiefly as irregular shoots, 4 to 7 feet thick, dipping at an angle of about 57°, in ferro-magnesian schists. The crude talc is very pure and practically no sorting is necessary to remove impurities.

Various portions of the deposit are opened by three shafts, but only one of these is being worked at present. The working shaft is sunk in the vein on an incline of about 60° to a depth of about 120 feet. At the 70-foot level a main drift has been driven along the vein in the ore, and shaft pillars 50 feet wide have been left to protect the shaft. From the main drift raises are put up and widened out into stopes. The two stopes now working are 100 feet and 60 feet long, respectively. The ore is soft and all drilling is by hand, either with augers or hand drills. The ore is shot down with "40 per cent" dynamite, and allowed to accumulate in the stope so that the roof is always accessible. Excess ore is drawn off through chutes in the raises into ½-ton, end-dump, mine cars. This mining method is similar to that used at Madoc, Ontario, and is known as shrinkage stoping. No timbering is needed in the main drifts, but 8-inch by 8-inch props or stulls are used in the stopes. All waste which must be removed is stored underground, rather than hoisted to the surface.

From the chutes the talc is trammed by hand to the shaft and dumped into ½-ton buckets running on skids in the shaft. The buckets are hoisted to the surface by a 16-h. p. gasoline hoist and dumped automatically into a 30-ton bin. Natural ventilation in the mine is poor, and air is furnished at the working faces by a small ventilating fan. The mine is dry so that no pumping is necessary. From the bin at the shaft the ore is drawn off into a 5-ton motor truck and hauled a distance of five miles to Riggs, the nearest shipping point, where it is loaded into railroad box cars and transported to the grinding mill at Los Angeles.

At the mill at Los Angeles the ore is unloaded by hand into wheelbarrows carried into the mill and dumped into a storage bin from which it is shovelled into an 8 by 15 inch Wheeling, forced-feed, jaw crusher. The progress of the talc through the mill may be followed from the appended



Flow Sheet—Pacific Coast Talc Company

flow sheet. The mill is driven by alternating current, 400-volt, 50-cycle, 5-ampere, motors, and a total of 122½ horsepower is used.

The finished product is of very high grade. It is very finely ground, has no grit, has excellent color, and a very good "slip' and has strong adhesion to the skin. A typical analysis shows 0.31 per cent lime (CaO) and 0.28 per cent iron oxide.

Other California companies which have been more or less active producers in recent years are noted below.

The Talc Products Company mine in 1¼ miles from Riggs Siding on the Tonopah and Tidewater Railroad, south of Death Valley Junction. The mill is at Los Angeles, it grinds talc only part of the time and has capacity of about 6 tons per 8-hour day.

The Pacific Minerals & Chemical Company mine is 6 miles from Acme on the Tonopah and Tidewater Railroad, south of Death Valley Junction. The mill is at Glendale, and has a capacity of 10 to 15 tons per 9-hour day. Fine grinding is done with two Fuller mills each equipped with a special vacuum air-separator. The product is pure white and more than 98 per cent will pass through a 200-mesh screen.

Machine Mixed Mortar

How a Pacific Coast Man Has Built Up a Successful Business

IN spite of the failure of every machine mixed mortar plant built since the idea was first conceived, in 1866, Mr. W. C. Hay, of Los Angeles, California, believed that it could be done.

He believed it so strongly, that, although he knew nothing about mortar or mortar mixing when he first became interested in the proposition in 1908, he set to work to succeed where countless others had failed, and despite the fact that experts said it could not be done. Mr. Hay told some of his experiences in detail at the recent convention of the National Lime Association.

During the first three years he built several plants of his own design, each of which was a failure. In 1913, however, after spending many thousands of dollars, and much time in further study and research work, he built a plant in Oakland, California, which was an immediate success. Its cost was low, operation simple, and results profitable.

Patents which Mr. Hay then had pending were later granted, and owing to the success of this plant, the San Francisco rights were soon purchased by those who were the chief stockholders in the Oakland plant.

In 1914 Mr. Hay designed and built the San Francisco plant, in which some added improvements were incorporated. Both plants were then taken over by the Atlas Mortar company, which now dominates the lime and mortar business of the two California Bay cities.

Mr. J. W. Jameson, a large and successful oil operator of California, after seeing the San Francisco plant, purchased the Los Angeles rights, and contracted with Mr. Hay to build the plant, which commenced business in 1916 under the name of the Blue Diamond Plaster Company. In spite of adverse conditions, the concern at once began marketing brick mortar in large volumes, a cubic yard being manufactured and hauled a distance of three miles for $2.10 per cubic yard.

Mr. Hay purchased an interest in the company, which was then incorporated for $100,000, and whose resources included a two-unit Hay Mortar plant with a capacity of 150 cubic yards of mortar, and 100 barrels of finishing putty a day; a small sand and gravel plant, and a few motor trucks.

Soon after the signing of the armistice, building became brisk, and the plant grew at a surprising rate. The Jameson Lime Company was taken over, a hydrating plant was erected, the largest stone crushing plant and quarry in Southern California was purchased, and exclusive marketing of a gypsum mill was secured. Today the company does the largest mason's supply business in the West, and the company has resources of one and one half million dollars.

The present retail prices on products of the plant are as follows:

Brick laying mortar	$4.25 per cu. yd.
Fibered lime plaster mortar	6.00 per cu. yd.
Keen's cement gauged lime plaster mortar	9.50 per cu. yd.
Lime putty	.70 per cu. ft.

These prices are all f. o. b. plant, and cartage is extra.

In most cities today, hand mixed mortar costs between $6.00 and $7.00, and fibered lime plaster costs around $13.75 per cubic yard when hand mixed on the job.

The question arises, "How can the plant make good profits at the prices obtained for the products?"

Generally speaking, for two reasons:

First, any grade of kiln run lime can be used.

Second, the process of manufacture is such as to effect a large economic saving.

Lime manufacturers will understand the saving made possible by the first reason.

The second reason can best be explained by describing the method of operation. The fundamental features embodied in Hay plants are as follows:

1. Low plant cost.

2. Minimum machinery installation of simple type and rugged construction.

3. Design such as to permit elastic operation that will allow small or large output without changing normal labor requirements.

4. Utilization of aerating principle.

These underlying principles of construction and operation have been closely adhered to in the Hay process. Following is more complete explanation of princples above outlined:

1. A single unit plant capable of a maintained daily output of upwards of 100 tons of finished mortars per day can be built at a cost of from $8,000.00 to $10,000.00. A two unit plant with upwards of 200 tons daily capacity can be erected at a cost of from $15,000.00 to $18,000.00.

2. The larger of these two plants contains only five separate machines. The designs are such that the machines are driven with a minimum power, while the wear and tear is negligible. The total power installation in the entire plant is less than 50 horsepower. All machines are driven by separate and direct connected electric motors.

3. The plant is operated to its capacity with two men, and if a tonnage of half the capacity of the plant is maintained, one operator is sufficient. The slaking, curing and mixing features are so arranged as to make it possible for the one operator to be kept busy continuously. The mixers are of a continuous type and are of such speed as to permit of the turning out of a finished cubic yard of mortar in two minutes.

4. The aeration of the cured lime putty is, without doubt, the greatest advance made in the art of producing ready-mixed mortar. By violently agitating the cured lime putty, it is given a spreading ability of upwards of 25 per cent of its former stretch. At the same time, this agitation does away with the very excessive labor handling charge that was formerly required. Also, this agitation reduces the stiff putty to a thick fluid consistency, making it possible to feed the cured lime paste in a steady, measured flow to the mixers.

When it is considered that this two-unit system with a large and elastic capacity can be erected at a cost of approximately $16,000.00, and can be operated to its capacity with two men with less than 50 horsepower and can produce the highest grade of mortars and putty with a saving in lime content of approximately one-third (kiln run, at that) than mortars prepared in other ways, you cannot wonder that these plants have made such a record of success in the cities in which they have been erected.

The Robinson Lime Company, incorporated at $250,000, was recently granted a charter for the operation of its plant at Winchester, Tenn. Directors of the company are: Arthur J. Robinson, Arthur Crownover, W. S. Claiborne, C. C. Ferriss and Mary H. Bates.

J. I. Allen of Lincoln, Neb., recently sold his interests in the Nebraska Material Company and also in the Lincoln Sand and Gravel Company to Victor W. Krause. The sale involved several changes in the officers of the Nebraska Material Company with the going of Mr. Allen who was vice president and general manager. Morris Friend remains as president under the new management with Victor W. Krause as vice president and treasurer.

Modern Method of Manufacturing Lime

By A. M. SCHOFIELD
Atlas Engineering Company, Amherst, Ohio

(Continued from June issue)

The process of hydrating lime is to satisfy the affinity of lime for water. This is a chemical process and the chemical reaction is in proportion to the atomic weight of the elements of the lime and water. In the case of high calcium lime the reaction would be:

Calcium oxide plus water equals calcium hydroxide;

Or, lime plus water equals hydrated lime;

Or, chemically expressed, $CaO+H_2O=Ca(HO)_2$.

We found before that the molecular weight of calcium oxide or lime is 56, that of water is $1\times2+16=18$, and that of calcium hydroxide or hydrated lime is $56+18=74$. From this it is seen that 56 pounds of high calcium lime will chemically combine with 18 pounds of water to produce 74 pounds of hydrated lime: Or, 1,516 pounds of this lime will combine with 484 pounds of water to make one ton of hydrated lime; Or, one ton of this high calcium limestone will make 1,477 pounds of hydrated lime; Or, to produce one ton of hydrated lime from this high calcium limestone will require 2,707 pounds of stone.

In hydrating magnesium lime two theories are in use. The first and oldest theory is based upon the assumption that the magnesium content of the lime remains in an inert state and only the calcium content is active or will hydrate.

The second or modern theory, which is now well established, is based upon the fact that the magnesium content of the lime is not inert, but that it is active, and hydrates to form magnesium hydroxide as well as the calcium hydrates to form calcium hydroxide.

When the process of hydration is carried out, the danger of the lime popping on the wall, or becoming unsound after it is put to use, is reduced to a minimum.

To carry out this process we will follow the lime from the cooling floor where it may be placed on a steel apron conveyor or be wheeled to the hydrating plant. Here it is passed through a crusher and reduced to ½-inch and finer. It is important to note here that the lime is crushed, not pulverized. Lime under no circumstances should be pulverized before it is hydrated, regardless of the process or type of hydrator used.

From the crusher the lime is lifted by chain and bucket elevators enclosed in steel housings, to the crushed lime storage bin. This bin is of steel construction, and large enough to hold two days output of the kilns. If desired a vibrating screen may be placed above the crushed lime bin, and the crushed lime be passed over this screen at time when there is a market for pulverized lime. The fines from the screen going to a separate bin to be sacked for the trade, the course or tailings go to the crushed lime bin. When there is no demand for pulverized lime the screen can be by-passed and all of the lime go direct to the crushed lime bin.

From this bin the lime flows by gravity to the hydrator feeders, where it is accurately and automatically measured, and flows to the hydrator in a continuous stream. The hydrator is a closed steam tight cylinder equipped with means to agitate and convey the mass through the operation. Water that has been heated to the proper temperature by waste heat of the hydrator is admitted through a regulating valve, and mingles with the lime

just as it enters the hydrator. During the process of hydration the lime undergoes a chemical change, satisfying its affinity for water in an atmosphere of vapor at the proper temperature and pressure, and is changed from a granular quick lime to a dry amorphous powder, hydrated lime, in which condition it is discharged from the hydrator in a continuous stream through a suitable sealing devise.

When the hydrate leaves the hydrator every particle has been subjected to moisture and steam and will have hydrated if it is an oxide that has an affinity for water, and changed to a hydroxide. In practice it is impossible to produce a pure lime, because the limestone from which the lime was made contained impurities, and there may be core, dead burned lime, cinder, pieces of brick from the kiln lining, nails or spikes from the quarry or cooling floor, pieces of wood, and any number of impurities get into the lime on its way to the hydrator. These must all be removed from the hydrated lime after it leaves the hydrator. In addition to these impurities, some of the hydrated lime may form small balls that must be broken up. For these reasons the hydrated lime flows from the hydrator to an elevator and is lifted and passed over vibrating screens. The fine finished hydrated lime passes through the screen to the finished lime bin and is ready to be sacked for the market. The material that does not go through the screen consists of the impurities mentioned above and the small balls of hydrate. This is carried to an additional bin, from which it flows to an impact mill where the balls of hydrate are broken up and all of the hydrate is lifted by air and delivered to the finished hydrated lime bin. The impurities are rejected from the impact mill, and conveyed to a pulverizer where they are pulverized and delivered to a bin for this purpose and are ready to be sacked for the market as a lower grade product, suitable for agricultural use. Under no conditions should the hydrated lime be pulverized. Hydrated lime that is properly made will all pass 100 mesh sieve and all matter in the hydrated lime that will not pass 100 mesh sieve is not hydrated lime and should be rejected. It is an error to grind all these impurities up to a fine powder and call the result hydrated lime.

In most cases the hydrated lime is put up in paper or cloth sacks of 50 pounds each. The most economical method is to use valve bags.

Engineering service for modern lime plants is furnished by The Atlas Engineering Co., who also furnish the equipment, if desired, including hydrators, together with the process, licensed under the Schofield patents.

The technical staff of the chemical department, National Lime Association, has been increased by the addition of Dr. G. J. Fink, formerly of the Hooker Electrochemical Company, and a graduate of Cornell University. Dr. Fink is an experienced research man, and it is expected that he will make all of his time available for research work on lime. In this work the properties and uses of lime in chemical and allied industries will be investigated, and reports will be made from time to time.

The Little Piney Sand & Gravel Company, Rollo, Mo., recently organized, will develop about 80 acres of sand and gravel properties on the Little Piney River. A daily output of from 5 to 10 tons will be established. C. B. Denton is president, and W. R. Bennett, vice-president and manager.

The Ohio State Utilities Commission has ordered freight rates reduced about 20 per cent on slag shipments within the state of Ohio.

The Great Western Silica Company's headquarters have been moved from 619 Provident Building, Tacoma, Wash., to 104 St. Regis Block, Ellensburg, Wash.

View of Plant of Lake Shore Stone Products Co. Under Construction. Arrow points to hole where crusher will be placed.

New Buckeye Company Opens Large Quarry

Sandusky Concern Has Sold Entire Season's Output

THE Lake Shore Stone Products Company is a new half-million-dollar concern with offices in Sandusky, Ohio.

The organization is made up of several men who are prominent in the business life of Sandusky and Cleveland.

Some years ago the Lake Shore & Michigan Railroad opened a large quarry near Sandusky, for the purpose of supplying themselves stone to build a fill across Sandusky Bay. When this work was completed, the quarry was abandoned, in so far as active operation is concerned.

There was, however, quite a lot of equipment on the place, and this, together with the fact that the quality of stone is exceedingly high, made the property one with unusual opportunities.

This is the property which was recently acquired by the Lake Shore Stone Products Company. It consists of several acres of high grade Dolomite stone, equipment, and a three-mile railroad, with cars and locomotives. The railroad has connections with the New York Central, the B. & O., Wheeling & Lake Erie, Big Four, Pennsylvania, and Lake Shore Electric roads. They have also acquired the old Butler Stone Company.

The first unit of the crushing plant is now installed, and the balance of a 5,000-ton capacity plant is going up as rapidly as possible.

This crushing plant is rather unusual, in that it will be countersunk below the surface about 30 feet. Stone can then be fed to the crusher by gravity direct from the quarry face. The crushed stone will then be elevated in bucket elevators to loading hoppers above.

Scales, office building, machine shops, and extra track are now under construction, and the company expects to be shipping stone over its own railroad in a few weeks. At present they are operating seven trucks, to deliver stone to their customers. They have secured enough orders to cover this season's output at prices ranging from $1.00 to $1.50 per ton.

The officers of the company are as follows:

President, Joseph Herbert Jr., Cleveland, Ohio, president, City Land & Mortgage Company, Cleveland.

Vice-president, Warren S. Stone, Cleveland, Ohio, president, Co-operative National Bank, Cleveland; president, Brotherhood Locomotive Engineers.

Secretary and treasurer, John A. Giedeman, Sandusky, Ohio, president, American Banking & Trust Company, Sandusky.

Officers of the Lake Shore Stone Products Co.

Directors, R. H. Shivley, Sandusky; Walter V. Bybee, Pittsburgh, Pa.

The concern is preparing to sell about $200,000 worth of 8 per cent cumulative stock, participating to 20 per cent, in order to complete the new plant and railroad. The sale of this stock has been authorized by the Blue Sky Department of Ohio.

Take Ladders Out of Your Quarry

"HOW deep is your quarry pit?" asked a visitor.

"As deep as the ladder," replied the operator jokingly as he started to descend it.

And so it proved, for the ladder was about 50 feet high, but it seemed like a hundred, for a blast had broken one side and here it was patched, and here and there a round was gone, and the visitor had to stretch his legs to reach the next round, so the depth seemed greater than it really was.

Ladders are difficult to maintain in quarries, as they become racked from use, are broken by blasts and heavy tools, and are at all times dangerous. The fact is, the deeper the quarry the more dangerous is the use of ladders. Many men entering and leaving quarries must carry small tools and other things in their hands, adding to the danger of descending and ascending the ladder.

Statistics compiled by the Bureau of Mines have shown that many men working in quarries are either injured or killed by the use of ladders. Even when an attempt is made to keep them in repair, a mis-step is made or a round breaks and a man gets a dangerous fall.

Every ladder in a quarry should be done away with and in place a stairway should be built. Heavy planks can be used, and treads can be nailed and supported by cleats between the planks. Such stairways will be found more useful and less dangerous than ladders, but such stairways are not as safe as those that have a tread cut on the frame and built with landing platforms at frequent intervals. Such a stairway costs more than either ladders or the steeper kind already mentioned but are more serviceable and safer.

Every stairway should have a hand rail built on it and a narrow plank nailed to the rail just above the tread and around the landing platforms to keep anything from being knocked off.

Rates Still Uppermost

This Question Continues to Absorb Much Attention in Indiana

By Our Indianapolis Correspondent

REDUCTIONS in intra-state rates may be ordered by the Indiana commission, if the Indiana public service commission can obtain a modification of a federal court injunction, which is interpreted as abolishment of a state commission's control over all freight rates, and a petition will probably be filed in the federal court for modification of the injunction by A. B. Cronk, who is in charge of the commission's rate bureau. He said there was no general revision of the state rates anticipated but the state commission would act in cases of formal complaints filed by shippers. The state commission might change many state rates, however, without causing any unjust burden on interstate commerce. Scores of petitions on such changes are pending before the commission filed by lumber, coal and sand and gravel interests. Similar petitions applying to other commodities could be filed and in case a modification of the injunction is obtained, many such petitions will be brought by shippers, as they have complained that carriers are changing commodity rates of 60 and 70 cents a ton for short-haul coal shipments, which they contend are only a switching movement bearing a rate of $10 a car. This question will be settled in case the modification of the injunction is secured by the commission.

According to an opinion of Attorney-General Lesh regarding the state rate situation, advised a modification of the injunction being sought before attempting a change, and in view of the character of the federal court order, referring to rate changes by the state commission, he said proceedings by the state commission might place every one in the position of violating the order.

The Indiana State Highway Commission proposed to "stand pat" on its decision not to buy more crushed stone than is absolutely necessary until the present high prices are reduced. A number of representatives of crushed stone companies in Indiana again called on the commission to discuss the situation recently. They wished the commission to recede from its earlier decision, it is said, not to use stone until war prices shall have passed. At the first conference on the subject several weeks ago, the stone men declined to reduce their prices. Representatives of gravel companies at the time offered to reduce their prices, it was said.

Seeking to restrain him from selling any more gravel from a gravel pit located on the farm on which he is a tenant, and to have him make an accounting of all gravel already sold, Mathias Shields instituted proceedings in injunction against Leroy Shields in common pleas court at Greenville recently. Leroy Shields is tenant on a 95 acre farm in Greenville township owned by the plaintiff.

Financial aid in the construction of stone and gravel roads may be obtained from the federal authorities. Plans and specifications, applicable for use on any highway, for the construction of stone and gravel roads, are being prepared by C. Gray, chief engineer for the Indiana highway department, which will be sent to the federal highway department in an effort to seek aid for such construction. As the federal department has aided stone and gravel construction in Illinois, Iowa and other western states it is thought they will do so in Indiana as well. Although gravel interests have reduced their prices very materially, stone interests will make no reduction in prices, and the state department has announced repeatedly that it intends building only

hard surface roads which are absolutely necessary, until there has been a further decline in material costs.

Mills of the Consolidated Stone Company, situated northwest of Bloomington, Ind., the largest in the white stone belt, were destroyed by fire recently. The loss is estimated at $250,000, with insurance of about $125,000. The mills were built four years ago. Ten saw gangs, twelve planers, three diamond saws and three travelers were burned, and about $15,000 worth of cut stone, ready for shipment to Chicago, was lost. The fire is said to have started from combustion in blacksmith coal. A. E. Dickinson, of Bedford, the Cleveland Sandstone Company, and New York and Chicago capitalists are the principal owners of the mills.

The Central Gravel Company, of Indianapolis, has filed a preliminary certificate of dissolution with the secretary of state.

Tight money conditions are causing Indianapolis property owners to pay from 15 to 20 per cent extra for street improvements this year, according to city officials. In addition to meeting material prices which are higher than before the war period the citizens must shoulder the increased burden of financing improvement projects which the contractors pass on from the bankers. Few, if any, street contractors, operate upon their own capital. When one of them is awarded a contract for, say the permanent improvement of a street, he borrows money from the banks with which to pay for material and labor. Under present conditions he has to pay between 7 and 8 per cent interest, usually 8 per cent. Some times the rate goes even higher, one contractor having reported to the city civil engineer's office that he had to pay 12 per cent, the excess over the legal 8 per cent being in the form of 2 per cent in commission and 2 per cent in discount. When the job is completed the builder does not get paid in cash. As a rule, about 80 per cent of what is coming to him is paid in Barrett law bonds because that part of the property owners assessed for the improvement elect to pay their share under the ten-year instead of cash plan. The contractor then pays off his note to the bank chiefly in Barrett law bonds. The banks, however, do not take the bonds at par at present. Under the law they bear only 6 per cent and the financiers usually put from 5 to 10 per cent discount upon them. Most of such securities now are sold at 90. Here is another 10 per cent loss for the contractor. Property owners cannot be blamed for paying under the Barrett law, it is said, because they have to pay only 6 per cent interest, whereas they can loan their cash at 7 per cent or an even higher rate.

The contractor does not shoulder the 8 to 12 per cent of his borrowed money nor the 5 to 10 per cent loss on his Barrett law bonds, according to city engineers.

New Scoop Body for Ford Trucks

The Easton Car & Construction Company of New York, announces a new scoop body for Ford trucks. It is simple, all-steel construction, and self-dumping; is furnished as a complete unit, and can be attached or detached by means of four U-bolts in ten minutes.

It is especially adapted for use by road builders, quarries, coal yards, industrial plants, sand and gravel plants, clay banks, etc., but it is claimed that, like the Ford, it is used for handling all sorts of materials, in all kinds of places, under all conditions. Sizes range from one-half to two cubic yards capacity.

The Allied Machinery Company of America, 51 Chambers street, New York City, has been appointed foreign representative for the Universal Crane Company, Cleveland, Ohio.

Road Building Brighter

This Helps to Bolster Up the Market in Eastern Territory

By Our Eastern Correspondent

The sand, gravel and crushed stone markets at New York and vicinity continue to hold their own against a lagging construction situation, but far brighter road-building trend. The activity is limited and conditions are spotty. There are far more inquiries than sales, although orders placed with certain producers in this section recently are of sufficient scope to insure continuous operation for weeks to come. There is a sort of a hopeful aspect to the situation, and those in the trade who are looking ahead view the future with confidence.

The usual decline in summer trade has not been quite so noticeable this year owing to the general dullness in conditions in recent months. State and county road-building work is now a feature of interest for producers, forming not only a desirable outlet for material, but giving assurance under sizable orders that there will be a marketing of practically all of current production, with a rapid turnover that makes business worth while. Many thousands of dollars are being spent in this direction, and contracts are growing more numerous in New York, New Jersey and Pennsylvania.

There is little if any change in the price situation with respect to sand, gravel and crushed stone. Portland cement has taken another drop, and indications are for further declines in different important building commodities, making likely a reduction in quotations of products within the pit and quarry field.

Sand holds at $1.25 a cubic yard in wholesale lots, with dealers pricing the material at $1.80, delivered. First grade white sand retains its $5.00 level under reduced call. Gravel, both 1½- and ¾-inch sizes shows no variation in a $2.50 quotation in cargo lots to dealers, while quotations at the material yards maintain at $4.25. Crushed stone varies from $2.00 for 1½-inch material to $2.15 for ¾-inch stock in cargo lots, per cubic yard, while $4.00 a cubic yard is the popular figure with the building material dealers, irrespective of size.

Portland cement is now being turned at $3.00 a barrel, delivered, with established bag rebate of 10 cents a bag. There is a fair call for the material and the outlook has features of particular encouragement. Common hydrate lime is quoted at $22.50 per ton by local dealers, while hydrate finishing stands at $26.00. Barreled material is selling for $4.70, finishing lime, and $4.50 for common lime, delivered.

The stone market remains passive, with prices maintaining stability at recently quoted levels. Limestone is selling for $1.78 per cubic foot for Indiana varieties, and $2.27 for Kentucky selections. Sandstone varies from $1.75 to $2.10, according to character, while bluestone is priced around the $2.00 level. Marble in mill block cuts, South Dover varieties, is selling for $2.25 a cubic foot, and selected sawed material from Vermont at $3.00.

The Rosoff Sand & Gravel Corporation, New York, has been formed with a capital of $500,000 to operate local sand and gravel properties. The incorporators are J. J. Ward, J. Ewan and S. D. Vreeland. The Company is represented by Wilder, Ewan & Patterson, 45 Cedar street.

The Continental Products Corporation, Rochester, N. Y., has been chartered under state laws with a capital of $250,000 to operate a quarry and crushed stone works in this section. The incorporators are M. R. Miller, G. C. Lennox and F. L. Smith, Pittsford, N. Y.

The D. de Belgrade Company, New

York, recently organized, will operate in the stone and marble business in this section. The company is headed by J. Laspia, and F. de Belgiade, New York, and is represented by F. J. Knorr, Albany, N. Y.

New Jersey crushed stone plants are keeping quite active with current work, formed for the most part of road-building operations; sand and gravel producers are also keeping up their outputs at a fair rate, with highway construction, likewise, an important source of sales. Housing developments in different parts of the state are also calling for fair quantities of material.

The Lanesboro Sand & Gravel Co., Stanhope, N. J., has been formed under state laws with capital of $50,000, to operate sand and gravel properties in this section. The company is headed by Fred W. Salmon and John C. Hodgson, Stanhope, and plans for extensive operations.

The M. & S. Sand Co., 149 Market Street, Camden, N. J., has been organized with a capital of $125,000 to operate sand and gravel properties. The local incorporators are F. R. Hansell, I. C. Clow and John A. MacPeak.

The Soffe Hydraulic Stone Co., Camden, N. J., has been incorporated with a capital of $125,000 to operate stone properties. The incorporators are John Soffe, J. Hary Smith, Jr., and M. Leon Berry, Sixth and Market streets.

The Stowe Trap Rock Co., Philadelphia, Pa., has been formed under state laws with a capital of $50,000, to deal in stone products. J. P. Murray, 921 South Fifteenth street, is treasurer.

The Consolidated Stone Co., Reading, Pa., has been incorporated with a capital of $9,000 to operate stone properties. Christopher Brenner, Reading, is treasurer.

The Pittsburgh, Pa., sand and gravel market continues quite active and producers are maintaining production well in accord with the demand for material. Sizable quantities of sand and gravel are reaching the local market daily, with prompt disposition of shipments. The Keystone Sand & Supply Company is operating between the local port and Coraopolis, Pa., and its two towboats, Peace and Clyde are bringing in large shipments of sand and gravel from the company's river plant. The company has recently placed its towboat, Victoria, in service, after a complete overhauling at the Neville Island Marine Ways. A new boiler and other equipment were installed. The Iron City Sand Company is developing good production at its properties at Glen Osborne, and is operating its towboat, Iron City, to this point from the local markets. The Rodgers Sand Company is maintaining its usual activity, and a large number of flats of sand and gravel are reaching the city for local trade.

Sand and gravel producers in the Pittsburgh district, headed by the Keystone Sand & Supply Company, are making a firm stand for a reduction in freight rates on sand and gravel in this section. There is an energetic and earnest effort to bring about lower tariffs, and it is held that these commodities are bearing more than their share of the transportation burdens. It has been shown that a car of sand or gravel shipped from a river plant to a coal mine pays more freight than a car of coal weighing the same, and shipped from the same mine to the same river plant. As the consumer usually pays the freight on sand and gravel, with the present high cost, orders are being curtailed, and wherever possible the materials are being secured from local sources. This means frequently inferior materials, and a loss to the established producers.

Kentucky Outlook Bright

Building Construction and Road Work Are Increasing

By Our Louisville Correspondent

WHILE the commercial business in crushed stone is still handicapped by the adverse conditions of higher freight rates, conditions generally are brightening considerably throughout Kentucky both in crushed stone and in sand and gravel. This is due to the fact that notwithstanding slow times financially and industrially, construction activities are fairly busy throughout the state. Not only is road building active but building construction in the towns and cities throughout the state has been moving along very nicely so that on the whole there is not much room for complaint.

Building permits issued during June reached a total slightly above a million dollars, which was more than double the May record and is one of the best records in the history of the building business in Kentucky. Not only that, but from different parts of the state, come reports of fairly active building, so that on the whole those handling sand and gravel for building purposes have a very good business.

It is road building, however, that constitutes the feature of widest interest and this is very active at the present time. Just a few days ago your correspondent had a trip to Paducah and on the train encountered a committee of west end men who had just been to Frankfort and who reported they had just had accepted by the road authorities plans for about a million dollars' worth of roads in three counties in the west and along the line of the Louisville Paducah River road. Also there was a stop off at Madisonville, and a trip across to Owensboro through the Green River Valley showed active construction going on in the building of a roadway from Madisonville to Owensboro. Meantime there comes to hand a report from Harlan in the east end of the state which tells of a proposition to build a roadway connecting Lynch, Ky., with Appalachia, Va., a twelve mile concrete highway through the black mountains. This, it is thought, will be but a part of a lot of good road work in the eastern mountain section, and all these are but a few of the incidents which mark the general activities of road building and the interest in road work in the state.

The State Highway Commission has drawn a resolution requesting Governor E. P. Morrow to appoint a commission for raising a permanent road building fund and has suggested a number of names of important public spirited men to constitute the commission from various districts who will be called to meet in Louisville during the State Fair week early in September to draw up a definite road program to be submitted to the state legislature. So not only is there considerable present activity in road building throughout the state, which makes for better business in stone crushing and in sand and gravel, but the prospects are bright for a continuation of road planning and building activities and this speaks well for the future.

The E. T. Slider Co., prominent in sand and gravel on both sides of the river here, report that this branch of the trade has picked up very nicely during July and they are fairly busy at the present writing. Street and road building contributes to better demand but activity in local building operations is helping considerably too. As a result of it all they have a fair trade now both in local delivery and in rail shipments.

This firm recently lost its dock boat

used for unloading and elevating at the Louisville yard and had to bring into play a temporary equipment. Now they have the hull of the new boat done and hope to have it equipped soon and be in better shape than ever with their handling facilities on the river front in Louisville.

Inquiry for F. W. Katterjohn, in Paducah, who has long been prominent in the stone crushing business, brought the information that he and his wife are making a two-months' tour in Europe at the present time.

U. S. Gypsum Fights Unions

$300,000 Fire Follows Wage Cut and Open Shop Notice

ON TUESDAY, June 28th, the Fort Dodge plant of the U, S. Gypsum Company issued a bulletin announcing a wage cut averaging 23 per cent, to take effect July first; and further, that beginning the first of July, the plant would be operated on an "open shop" policy.

Early Wednesday morning, July 29th, fire was discovered in the block plant, which, despite all efforts of the fire departments to stop it, completely destroyed the block plant and one warehouse. The loss will total more than $300,000, the large portion of which, however, is covered by a blanket form of insurance.

The origin of the fire is unknown. There was a severe electrical storm that night, and the theory that the fire was started by lightning has been generally accepted, although the fire was not discovered until several hours after the storm had passed.

If it was lightning, it is an exceedingly peculiar coincidence that it should happen so closely following an announcement which could not have failed to arouse the resentment of the unions. On the other hand, if the fire was of incendiary origin, it was extremely short-sighted on the part of the union, or whoever might have done it, because it will throw a large number of men out of work for an indefinite period, even though the company should rescind their order, which is quite unlikely.

The company was faced with the alternative of either closing down entirely, or cutting wages; and, together the American Cement Plaster Company, the Wassem Plaster Company, the Cardiff Company, and the Plymouth Gypsum Company, all of Fort Dodge, they decided that the wisest course not only for themselves, but for the men and for the economic betterment of the country generally, was to reduce wages.

The reason for establishing an open shop policy, was to enable them to reduce the prices of their products with the trend of the market, according to officials of the company.' In the past, it has been the policy of the companies to sign contracts with the unions once a year, for a stated wage for the next year. This, they say, under prevailing conditions, will be impossible.

On Friday, July first, not a man showed up for work at any of the five plants, and early in the day they were all notified that the men were striking in an effort to force the companies to recognize the unions, and also to force negotiations for an adjusted wage scale during the coming year.

The U. S. Gypsum Company will rebuild the Fort Dodge plant in the near future.

The Linwood Stone & Cement Company, Davenport, Iowa, has reduced wages 20 per cent, and is now paying 35 and 40 cents per hour.

The Wausau Abrasives Company has discontinued its Chicago office and is now located at Wausau, Wis., where the quarry is located.

St. Louis Cuts Prices

Effort Made to Get a Construction Program Under Way

ON July 1 in St. Louis a reduction was made of 10 cents a barrel for cement and 10 cents a ton for Mississippi river sand and gravel delivered in St. Louis and St. Louis county.

Gordon Willis, president of the Hunkins-Willis Company, predicted a further reduction in the price of building material very quickly if the wage scales of building mechanics and laborers were decreased sufficiently to stimulate new construction.

The new prices of cement, sand and gravel to contractors are:

In truck loads, delivered to job:

Cement: $2.95 a barrel net, less 5 per cent for cash by the 15th of the month following delivery.

Mississippi sand: $2.40 a ton, less 5 per cent for cash by the 15th of the month following delivery.

Meramec river sand: $2.55 a ton net, less 2 per cent for cash by the 15th of the month following delivery.

Binder gravel: $2.40 a ton, less 2 per cent for cash by the 15th of the month following delivery.

In carload lots delivered:

Cement: $2.50 a barrel, less 10 cents a barrel for cash within ten days after shipment.

Mississippi river sand: $1.50 a ton, less 2 per cent for cash, by the 15th of the month following delivery.

Meramec river sand: $1.65 a ton, less 2 per cent for cash by the 15th of the month following delivery.

Binder gravel: $1.50 a ton less 2 per cent for cash by the 15th of the month following delivery.

Meramec river sand prices unchanged from last month.

The cement price to dealers remains at $2.37 a ton, less 10 cents for cash within ten days after delivery. The price of Mississippi river sand and gravel to dealers was reduced 10 cents a ton. On sand and gravel dealers get a discount of 12 per cent for cash if the bill is paid by the 20th of the month following delivery.

Contractors and dealers are required to make a deposit of 40 cents a barrel for sacks in buying cement. This deposit is returned on the return of the sacks in good condition. This makes the gross price of cement $3.35 a barrel in truck loads and $2.90 in carloads to contractors.

The present price of cement is 50 cents a barrel less than the peak prices of a year ago, while Mississippi river sand and gravel have been cut 20 cents a ton. Meramec river sand is 10 cents a ton less than a year ago.

Two New Industrial Films

Two educational motion pictures illustrative of the mineral industry have recently been completed, the United States Bureau of Mines announces. The first of these, the Story of Abrasives, shows the generation of power at Niagara Falls, its utilization for the production of carborundum (silicide of carbon), and aloxite (aluminum sesquioxide), and finally the numerous interesting and important industrial operations that are performed with the aid of the abrasives thus manufactured.

The Story of Rock Drilling shows the use of modern types of rock drill, not only for shaft-sinking and underground operations, but also for quarrying and the cutting of the new hydroelectric power canal to connect Lake Erie with Lake Ontario. Requests for the loan of these films for showing at public gatherings where no admission fee is charged should be addressed to the Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

The Monolith cement plant at Los Angeles is reported sold to the United States Potash Company for $450,000.

Subterranean Gravel Pit

New Plant Pulls Sand and Gravel From Bed 30 Feet Under Earth's Surface

A FEW months ago there were 260 acres of land in North Memphis, Tennessee, known as McCarvers tract, on which were frog ponds, mosquito breeding holes and some tillable ground. The property was spurned as an investment.

J. A. Lehaney, however, who is the Memphis agent of the Missouri Portland Cement Company, persuaded his company to have experts give the ground a thorough examination for strata of sand and gravel under the surface of the rich soil.

Following the opinion of experts, the property was purchased and gangs of men were set to work cleaning out underbrush along the lowlands. Today one of the most modern sand and gravel plants in the South occupies this supposedly worthless spot.

The company has constructed concrete storage bins 70 feet high into which the sand is taken through a large suction pipe, with one end extending down 30 feet below the surface of the water, where a stratum of very fine sand and gravel is found.

Mr. Lehaney says from reports of experts, he believes the supply of this sand is inexhaustible.

The dredge boat is very large, and is constructed of steel. It is equipped with a 16-inch pump, which gives the plant a capacity of 2,000 tons per day. The plant is operated by electricity throughout, a 500 horsepower motor driving the pump.

The company has constructed its own switching yards and owns its own cars.

Recent Patents

The following patents of interest to the readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,380,444. Excavating-bucket. William M. Venable, Pittsburgh, Pa., assignor to Blaw-Knox Co., same place.

1,380,790. Excavator. Theophil J. Freda, Detroit, Mich.

1,381,362. Crushing-roll machine. Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass.

1,381,987. Grinding-mill. Robert W. Gordon and Arthur C. Daman, Denver, Colo., assignor to Stearns Roger Manufacturing Company.

1,382,775. Stone-drilling engine. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Company, Boston, Mass.

1,382,776. Stone-drilling engine. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Boston, Mass.

1,382,777. Cutting-tool. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Company, Boston, Mass.

1,382,778. Rock-drill. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Company, Boston, Mass.

1,383,102. Excavator-dipper door. John J. Greuling, Hibbing, Minn.

High Explosives Catalog

E. I. du Pont de Nemours & Co., Inc., is now issuing a 28-page booklet covering the kinds, grades and brands of high explosives manufactured by that company. The important properties of each variety of explosives are given, as well as the class of work to which it is adapted. This booklet, which has recently been revised, together with High Explosive Catalog—Section 1, gives a fairly complete idea of the manufacture, storage and use of explosives for all purposes. Both catalogs are profusely illustrated.

New Corporations

The Little Piney Sand and Gravel Company, Rolla, Mo., has been incorporated by W. R. Bennett, C. B. E. Denton and J. A. Clark with a capital of $20,000. It will operate on the Little Piney River, midway between Newburg and Arlington, where there are extensive deposits of sand and gravel.

The Peekskill Creek Gravel Corporation, Peekskill, New Jersey, has been incorporated with a capital of $200,000. Incorporator: J. M. Clark, 81 Halstead street, East Orange, N. J.

Consolidated Stone Company of Reading, Penn., was incorporated with a capital stock of $9,000. Christopher Brenner, treasurer.

Milford Sand & Gravel Co., Milford, Iowa, was incorporated with a capital stock of $200,000. Floyd Goodrich, president, Humboldt, Iowa; Geo. F. Sokol, vice-president, Sibley, Iowa; F. D. Pearce, secretary and treasurer, Mason City, Iowa.

Central Sand & Gravel Company, Des Moines, Iowa, has been incorporated with a capital stock of $50,000. W. R. Gibson, president; Harry L. Gross, vice-president; C. W. Layman, secretary; John H. Gibson, treasurer.

The Decorah Stone Products Company, Decorah, Iowa, have recently been incorporated with a capital stock of $25,000. The officers are E. F. Sellman, president, W. B. Reed, vice-president, and Richard Bucknell, Sr., secretary and treasurer.

Stowe Trap-Rock Company, of Philadelphia, Pa., has incorporated with a capital stock of $50,000, paid in $5,000, par $100.00. Treasurer Jos. P. Murray, 921 South 50th street, Philadelphia, Pa. The incorporators are: Jos. P. Murray, Philadelphia, Pa., Frank S. Mussey, Philadelphia, Pa., and F. Stanley Sauerman, Churchville, Pa.

Wm. Wolf Sand and Gravel Co., Inc., of West Allis, Wis., have incorporated with a capital of $5,000,—50 shares at par value of $100 per share. The incorporators are William Wolf, Hugo Schulz and John H. Schmidt, all of West Allis, Wis.

Horicon Sand, Gravel and Tile Company, of Horicon, Wis., has been incorporated with a capital of $40,000—400 shares of $100 each. The incorporators are E. C. Able, Jennie B. Beichl and W. W. Koch, all of Horicon, Wis.

The Vollbrecht Cut Stone Company of Milwaukee, Wis., has been incorporated with a capital of $20,000—200 shares par $100 each. The incorporators are A. J. Vollbrecht, Milwaukee; H. F. Biggam, Milwaukee, and Waldemar C. Wehe, 425 E. Water street, Milwaukee. The purpose of this company is to buy and manufacture stones and minerals.

The Fond du Lac Cement Products Company, of Fond du Lac, Wis., has been incorporated with a capital of $25,000—250 par $100. The officers are John L. Fox, president, 15 Fourth street, Fon du Lac; Joseph Wirth, vice-president, R. F. D., Fond du Lac, and Herman S. Engel, secretary and treasurer, West Division street, Fond du Lac. The above mentioned are also incorporators.

New Link Belt Book on Belt Conveyors

A New Book on Belt Conveyors has just been published by the Link-Belt Company of Chicago, Philadelphia and Indianapolis.

It is book No. 215. It fully describes the Uniroll and Multiroll Idlers recommended by this company.

Among the interesting features of the book are:

1. The correct methods of figuring belt conveyors and the details entering into them.

2. Price lists which will enable the user to determine the cost of a complete conveyor or any portion of a conveyor.

3. Numerous examples suggesting the correct types of belt conveyors for the handling of bituminous coal, by-product coke, sand and gravel, bagged sugar or similar material, crushed rock, etc.

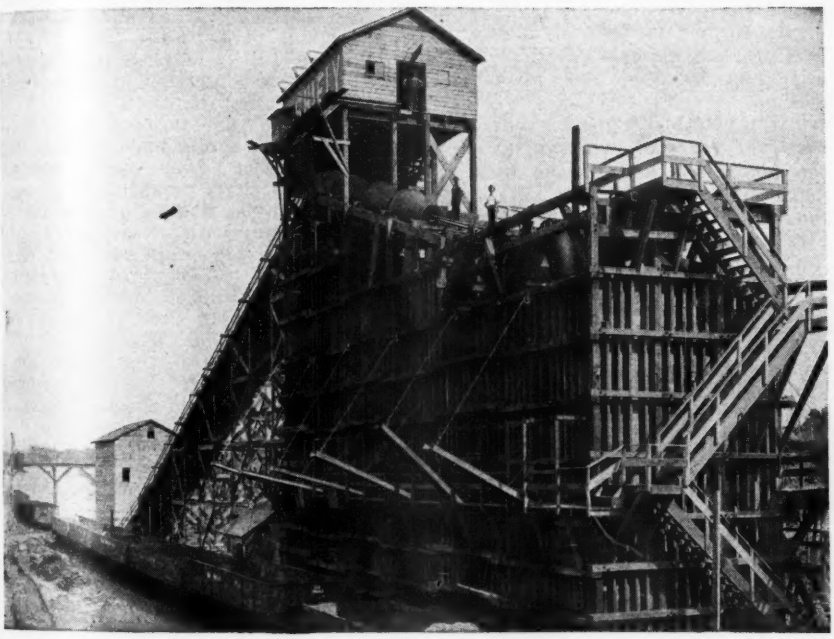
4. In addition there are many illustrations of typical installations.

This book should be a valuable addition to any library and will be sent by the Link-Belt Company to anyone interested in this subject.

The Magnolia Gravel Company has recently been organized in Dallas, Texas, with a capital stock of $5,100. The incorporators are: Sam Bono, Frank Musso and Ingargiola Dominico. This company has acquired gravel beds near Dallas and will enter actively into the sale and delivery of gravel to the general trade.

LINK-BELT

Sand and Gravel Plants



This Link-Belt Sand and Gravel Plant of the J. L. Shiely Co., St. Paul, Minn., is equipped with Dull Inclined Conical Screens and Conical Sand Separators. It is designed to wash and screen sand and gravel as well as a separate grading and washing of crushed boulders. It has a capacity of 3,000 tons daily, including three grades of gravel, two of sand and two of washed crushed stone.

A storage system consisting of two Link-Belt Belt Conveyors with trippers, is provided, to store any one of the seven grades of material produced, in separate piles.

Send for Catalog No. 440 "Link-Belt Plants for Washing Sand and Gravel." It shows what Link-Belt equipment has accomplished for many concerns, under a wide variety of conditions.

LINK-BELT COMPANY

PHILADELPHIA
Hunting Park Ave. and Pa. R. Rwy.

CHICAGO
300 W. 39th St.

Low Freezing Dynamite

The Du Pont Company has developed and perfected a formula for the manufacture of straight dynamite which results in that explosive being proof against freezing even in zero temperatures. As a consequence of this developement, the company has determined to discontinue the manufacture of its former straight dynamite and hereafter all this kind of explosive will be made by the new low-freezing method.

The perfection of the formula is the result of years of experimentation in the laboratory and in the field and marks one of the greatest advances in the art of explosive manufacture. Straight dynamite has for years been the standard of the world in nearly every kind of open work, but a disadvantage has been its liability to freeze at temperatures below 50 degrees Fahrenheit. As any dynamite loses some part, if not all, of its efficiency when chilled or frozen, many attempts have been made to make it low-freezing.

The perfection of the new "powder" by the Du Pont Company makes it possible to use straight dynamite the year round in industrial operations. Thawing, with its loss of time and attendant dangers, has practically been eliminated.

The new explosive has been fully tested and proved and the formula for making it has been made standard in all the plants of the company producing dynamite.

New Type Crane

The Locomotive Crane Co. of America announces that it has discontinued the manufacture of the old type crane with the friction spring swinging clutch, and from now on will turn out a new type, P. A., machine with a new planitary gear swing.

This is a great improvement over the old method of swinging a crane, and is so designed that it can be readily attached to cranes equipped with coil clutch swing.

The Woodville Lime Products Company, Toledo, Ohio, has reduced common labor from 50 cents to 40 cents per hour.

New Byers Crane Finds Ready Market

The John F. Byers Company, of Revenna, Ohio, announce in Bulletin No. 1031, a new model 7-ton full-revolving crane. This new model rounds out the Byers line, enabling them to furnish the road type crane in three sizes—half cubic yard and three-quarter cubic yard "Auto Crane" types, and the full revolving type with a choice of power and mounting to suit customers' requirements.

The new crane is 90 per cent steel construction; can be had equipped with three kinds of power—steam, gasoline and electricity, mountings of road wheels, single, double or full length crawling traction, or rail trucks; ⅞ cubic yard material handling clam shell, or ¾ cubic yard excavating bucket, steam shovel, hook or magnet. All gears are of steel, with bronze bushings in all movable parts.

The new crane is built in a shop, 60 feet by 120 feet, with overhead traveling crane, and production on a large scale has started.

Mr. L. A. Babcox, sales manager of the Byers organization, states that sales have thus far exceeded expectations.

The San Francisco office of the Pawling & Harnischfeger Co., of Milwaukee, has been moved from the Monadnock Building to 32 Beale St. At this new address the company maintains a complete service station, warehouse and display room for cranes and hoists, machine tools, and excavating machinery. Mr. R. M. Taylor, district manager for the Pacific Coast, has his headquarters now at the Beale Street address. Mr. J. MacFerran Taylor is a new member of the Pacific Coast sales district.

The Granite Dealers' & Cutters Association of Berks, Schuylkill, Lehigh and Northampton Counties, Pa., held its annual outing at Kutztown, near Reading, Pa., on July 11. A short business session was held in connection with the event, at which a number of important trade topics were discussed. Samuel F. Eisenbrown is president, and Howard Tobias, secretary and treasurer.